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ABSTRACT

Written for science teachers of elementary and secondary Native American students, the guide offers 18 science-related activities that integrate science with Indian culture and life. A teacher preparation exercise is presented first to allow the teacher to look at him/herself and use the information as a tool to understanding the students' learning processes. Each activity provides the following information: grade level, time it takes for activity, notes to the teacher, equipment (if any), objectives, sample discussion topics and questions, illustrations, and instructions on conducting the activity. Activities include sensory walk, the life box, for lichen-likers, an earth cake, the earth as an apple, have you thanked a green plant today, the village house, mini-climates, and the story of water. Other lessons presented are the web of life, the animal world, animal house, from the ground up, ecosystem, strands walk, and for urban studies. Suggestions for leading students in the field, a bibliography, and further reading and enrichment sections are also provided for the teacher. (ERB)

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A Guide for Teachers of Native American Students

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Introduce Science to Students Using the Environment

Written by Deborah Richau

A Joint Project of
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1981

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Introduce
Science to
Students
Using the
Environment

Introduction

> We are told "get your education--that's the only way to survive" and "remain Indian--that's the only way to keep your respect."

The dilemma implied by these words articulates a concern experienced and expressed by many Native Americans who have participated in a series of conferences held to encourage Indian initiatives in elementary and secondary science education. Science--often perceived as alien to Indian culture and usually taught as remote from daily existence--is still recognized for its potential to bridge the cultural gap and its necessity to the struggle for self determination and tribal survival. At each of these conferences, the need to "rethink" science in harmony with Indian culture was emphasized.

This handbook for teachers is one attempt to respond to this widely felt need. We plan a series of guides in the sciences for teachers of Native American students. These materials will be part of an ISSUE curriculum series designed to use the environment to introduce the sciences.

Our work in Native American communities has strengthened our commitment to support an educational climate in which students are made comfortable with the sciences and see their utility, personally and to the tribe. As science becomes integrated with Indian life, it can complement instead of antagonize and assist instead of alienate so that "getting one's education in order to survive" becomes a "means of remaining Indian to keep one's respect."

Gary G. Allen
Director-Pre-College
Teacher Development Project
Northern Arizona University
Summer 1981

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Author's Preface

Native Americans are increasingly needed to fill positions dealing with resource management and development on their reservations. Technology is also coming to play a greater role in Indian communities.

This handbook is designed for teachers of Native American students in classrooms across the reservations. The lessons are not to be equated with a science text. Rather, the contents combine the students' culture, language and natural environment as a means of introducing the sciences. The lessions are targeted by grade; however, they are easily adaptable by supplementing or deleting material.

Special thanks to Gary Allen, Northern Arizona University, for the idea, editing and encouragement, Lucille Hill, for the perfect typing; my family for enduring mountains of paper and books on the kitchen table; the Billings School District for seven years' experience working in the state of Montana; Robin Butterfield of Northwest Laboratory for referencing the Indian Reading Series; and Melvin Redboy, Michael Driftwood, Stella Begay and Pam Richau for the illustrations in the handbook.

The U.S. Forest Service, the National Park Service and the Bureau of Land Management have all contributed excellent material that was adapted for the handbook. The Montana Inter-Tribal Policy Board and others working in native communities contributed reviews of earlier drafts which were invaluable.

Billings, Montana
June 1981

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SPECIAL PREFACE

TEACHING SCIENCE IN THE OUTDOOR ENVIRONMENT

At best, doing a good job of teaching science is not easy. Often the goals and objectives for teaching are not clear and the content provided through textbooks does not seem to have great importance. There is always a question about the balance between content and process. Teachers always feel that science should involve the laboratory, yet materials are lacking; equipment is faulty or not easily operated; there is no way to keep live plants and animals; and actual laboratory facilities are either poor or non-existent. On top of this for reasons that may be ill-advised, the priorities for teaching have shifted in the last few years to a heavy emphasis on basic reading and arithmetic and a deemphasis on science and the social studies. To many teachers, all of this is more than enough reason to avoid involving students in investigating the things that happen around them.

Unfortunately, ignoring teaching science is not an acceptable alternative for teachers who really care about giving their students a good general education and a chance to develop skills that will be essential to further learning. Good science experiences are designed to accomplish much more than merely reinforce knowledge. The science education done correctly is an experience in investigation and problem solving.

In recent years, a lot of thought has gone into the concerns of teachers required to teach science, and many of those concerns seem to be at least partially resolved by getting outside the classroom. Even in an urban environment, the school playground provides a myriad of interactions of living and nonliving things from which questions can be raised. The way ants can build a home in the crack of a sidewalk; the way grass or dandelions can survive in a crack in a blacktop pavement; the way in which the pavement itself seems to crack and break during the winter months; freezing, thawing and evaporation of puddles; worms in the soil; birds in the air; the way things move, shake or flutter in the wind; shadows changing with the seasons. All of these things can be used to raise questions. And seeking answers to these questions can become an active involvement in the outdoor environment. If the limited urban environment can be so productive, the imagination stirred by this guide should make the natural environment of a rural, low population center even more so. Consider the questions that are raised from observation. Flowers bloom and fade quickly in the desert; rain washes away surface dust; plants are different in the woods from those in the meadow; many animals are seen only at night; some insects can walk on water; trees grow to different heights.

Questions are never answered without making observations and measurements, and the results of these observations always require a degree of analysis, and the analysis itself is of very little use unless it is used in explaining the way the question was asked in the first place. This total process is the problem solving process as it best applies to the natural environment. Learning problem solving skills requires first-hand experience and practice. It is not learned from class discussion and it does not come automatically with knowledge.

A common mistake is taking children who spend most of their free time in a very productive and interesting outdoor surrounding and placing them in a sterile, poorly furnished classroom with desks in straight lines and hard-backed science textbooks as the only major learning resource. Science under these conditions is neither interesting to the teacher nor to the students. In some cases, the indoor facility and the equipment and materials provided are excellent and good science education results. More often, the limitation of the classroom makes it obvious that there can be a great advantage in planning to use the outdoors.

A word of caution. The outdoor environment can be a distraction, and unless the teacher and the class as a whole approaches the outdoors with interest and a plan to learn, the intended learning experience can become totally unproductive. Education outdoors require at least as much planning as the indoor variety. Using the planned observations and questions which this guide provides, random wandering and a disappointing waste of time will be avoided. Also, without proper management, discipline problems that were apparent in the classroom can become greater problems with the informality that cannot be avoided outdoors.

With prior planning and good understanding of the guide's learning objectives and lesson plans, the outdoor environment becomes a solution to a major problem that all elementary, middle and junior high school teachers have faced. Students can become inquisitive and can enjoy learning. They can be personally involved in science rather than passive listeners forced to endure session after session with a bored teacher. Introduce the sciences using the environment and everyone will be rewarded.

Kenneth Dowling
Science Supervisor
Department of Public Instruction
State of Wisconsin

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WHY ARE YOU HERE?

> "Teach students to teach themselves;
> Teach them to see, hear, taste,
> smell, touch, and be touched;
> Teach them silence to see better the
> flow of life around them."
>
> Author unknown

In order for us as teachers to assist students in learning, we must first examine our own feelings and understand a way to examine them and the reasons for them. This section has been designed for you to learn more about yourself and the reasons you are the way you are today. The exercises in this section are not to be directly applied to students, but altered to suit their developments. Perhaps you will never use these with your students. It is good to look at yourself and use information as a tool to understanding your students' learning processes.

First of all, we know we are not in the classroom to indoctrinate students with our ideas and opinions. We are there to offer information. If the information has one or more points of view, it is really our responsibility to offer more than one viewpoint. Our position as teachers is, ideally, to remain objective. Isn't that idealistic? The mere fact that we are in the classroom tells the students something about our attitudes and our values. We obviously think education is important.

What motivates you to teach in the first place? You may instantly think of money' Or more accurately, the lack of money. You may think back to some teacher you had that showed you a path to knowledge, and so, you joined the profession. You may simply love kids...sharing and growing with them in a learning situation. Maybe you are attracted to the showmanship involved in teaching; or you like being in control. Whatever the reasons may be, they will affect the way you function and perform in the role of a teacher.

Take out your favorite pen and some paper. Make a list of things or people or events that have led you to be the kind of person you are.

Home
Family
Education
Religion
Peers (past and present)
Money
Surroundings

Now, get more specific with all of these items:

- What kind of home did you grow up in?
- What kind of home are you making now? (Both physically and emotionally?)
- What was your placement in the family? What role did you take in your family?
- Were you the helpful one? Were you the mischievous middle child? Were you the only child?
- What kind of family are you forming now?
- What kind of education did you have?
- Did you come from a class of thousands?
- Did you move several times from city to city to different schools?
- Was there religion in your home life or even in your schooling?
- Where are you with religion right now?
- What kind of effect did your peers have on the way you behaved when you were a small person?
- Do your peers have any effect on the way you behave now?
- When you were growing up, was money a problem?
- Did you work as a youngster?
- What part does money play in your life today?
- Where are you right now?
- Are you where you want to be?

Hopefully, these questions will jar some things loose we don't think about very often. Then some people cannot get one or the other of the questions off their minds. There are many other things that make you the way you are today. List them on your own and pose some jabbing questions for yourself. This takes more courage than it takes time. Do you have it? Since you are on your own right now, no one is going to test your answers...no one is going to judge them. This is your opportunity to be honest.

Do you have a characteristic you dislike in yourself? Do you talk too much, laugh too loud, tell secrets, shut off well-intentioned compliments, hide your lack of understanding of the economic process, or stifle anger at the prejudice shown in the community? Well, let's consider the thing in you that you wish you did not have. What makes that thing inside you go on? Several answers may surface, and you now know, that once named, they can be dealt with. Why is it necessary to look at ourselves so closely? Once again, the kind of person that we are is reflected in the classroom. Those bright eyes see us for what we really are, every day. They learn how to be the way they are from us. Watch out! This is not to say we, as teachers, must display at all times the perfect person. That is not realistic. More than anything, we should offer reality in the classroom. When a kid yells, "That is not fair!", I cannot control myself in saying, "Hey, who said life was fair, anyway? Is water distributed evenly all over the earth? Is it fair that Minnesota has the lakes and Arizona is dry? Maybe not, but then the fish in Minnesota think it's okay, and the cactus in Arizona aren't crabbing at all." So, fairness is handling what we have to the fullest advantage. So, too, does a teacher have to take inventory to better use talents and special offerings for students. Take stock of yourself.

And now, the teacher......

You have looked at the kind of person you are and how you got to be that kind of person. Now let's see if we can discover what kind of teacher you are. Aha! Don't turn away...this is very private. Only a classroom of bright eyes really knows for sure--and you, of course.

Your idea of what a good teacher is was formed somewhere in your past for the first time. When you were in your first year of formal school, as with most babies of pencil and pen, your first teacher was an idol. You may have tried to copy that person's characteristics and tried to please her in every way possible.

What is a teacher?

One who leads children through lessons to help them learn how to read? Is a teacher one who maintains order and continuity in a room full of nine-year-olds? Is the teacher a babysitter? A mother? A nurse? A psychiatrist? A walking encyclopedia with feelings?

List all the things that you do as a teacher from the time you walk in the school door until your head hits the pillow at night.

-- From that list, choose your favorite things. Make a tiny, little heart next to them.

-- Choose your most hated chores. Put an "x" beside them.

-- Find all the things you do that cost money from your own pocket. Put a "$" next to them.

-- Find all the things you wish you had help with. Put an "H" next to them.

-- Find all the things that you presently do have help with that you wish they would leave you alone to do your own way. Put an "A" next to those items.

- - - - - - - -

-- List the subjects that you teach (all of them).

-- Now list the things you wish you could add.

-- Now of the combined two lists, make up the ideal subjects to teach children in your situation.

You have listed what you do teach, what you would add to that, and then made up your own teaching curriculum.

-- What would you take away if the day were cut in half?

-- What would you teach if other things weren't required?

Now, the hard part. WHY have you chosen the subjects you have?

You now have a perfect curriculum. You have designated the things you love, hate, would need help with, and wish to do alone, and the things that you do that cost you money from your own pocket. List the time you put in that is not paid for on your present contract. You should have a fairly accurate picture of what your teaching situation is now, and a vision of the way you would like things to be in your teaching situation and some reasons for wanting them that way.

Look at the WAY you teach. There are, without any doubt, some rules in your school. Some rules are written down and abided by without question for safety, etc. Some unwritten rules exist in every school for a number of reasons. These rules, written and unwritten, dictate to some degree the way you teach. Again, answer these questions as candidly as possible:

- What is the first and last thing you do as the children enter and leave the classroom?
- Where do you spend your time in the classroom?
- Where do the children sit? Where do they stand?
- Have you had a recent visitor in class? When, why, and for how long?

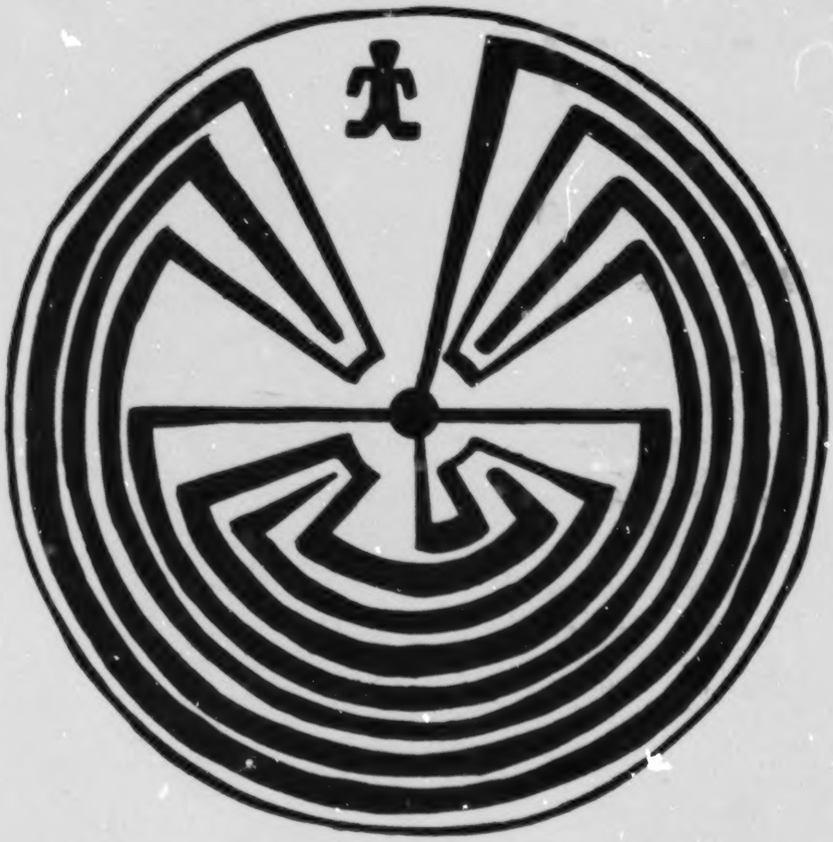
- Other than people, what else in your classroom is living?
- Do you have an outdoor classroom or do you use any other area for your teaching?

The responses to these questions should give you an idea about the way you feel about your students and your classroom. These responses affect the way you teach. The way you teach has a great deal to do with the kind of climate you have in your classroom.

These lesson plans will help any teacher use what she already possesses of talents, caring, and nurturing attitudes to lead the students down a path of good habits to facilitate the growth that is inevitable in all of us. No complex equipment is necessary. This resource book is designed to help you look at the earth and its arrangement. Use the earth as a teaching tool. Use all your senses to study this arrangement. Then apply these arrangements to learning.

The following story is for you, the teacher. It sets the tone for all you will do with your students, using this handbook.

Put yourself in the teacher's place...relax...and learn how to teach children science outdoors. And, learn why you are here.



The Maze is a philosophy of Life. It tells of the complicated, difficult and often puzzling way a man must walk to find Happiness at the Center of the Maze. Though he seems at times to be going in the opposite direction, if man will persevere, he will find Happiness and Peace.

THE PATH TO DISCOVERY

The child felt lazy and warm on the fall day walking home from school. Small beads of perspiration began to form on his brow as the sun beat on his black hair. His tennis shoes were loose and spotted as worn hand-me-downs from his cousin. Scuffling along on the dusty path that connected the two lengths of sidewalk with tall dried weeds on both sides, the boy noticed a feather in his path. Picking it up and stroking the feather with tempra - stained fingers, the boy smelled the feather. It carried no distinct odor of its own. What the boy did smell was the paint along his fingernails and the dust from the earth where the feather has rested. The boy quickly looked to the sky as if the feather had been a gift from the sky; and then searching as if the bearer of the gift may be watching to see the pleasure in the finder's face. But, no bird was in sight. Only the horizon of willows along the creek and a few thin clouds. But, aha!

The creek was a small one. Small enough, in fact, that last spring one of the classes in his school had built a foot bridge across the creek. Now, the creek could be waded. Along the curves of the creek, clumps of willows grew. Leaves were starting to turn and fall as the days became shorter and the nights colder. The spaces left vacant by the falling leaves revealed a hiding spot not visible even a few days earlier. But the boy, shielding his eyes from the sun, looked to the willows and saw there a nest.

Running to the foot bridge, the boy made his way to the nest--or so he thought. Well, the nest was a bit higher than it looked from the path across the creek. It was also built to the far side of the bushy willow, but now he wanted to see more.

He looked around the ground beneath the nest. He scuffed the fallen leaves, looking for more feathers. Eventually the boy had examined the area under the nest and discovered three more feathers, droppings of varying ages, and some nesting material. There had been some harsh wind two days ago...maybe the wind blew some of the nest down. The boy spent more time on his hands and knees looking through the debris under the tree. He felt the top earth and its recent heat from the day's sun. He felt the layer under the fallen leaves, then the damp coolness. He smelled the musty decaying odor that accompanied the autumn process of making soil. He smelled the mint growing near the bank of the creek. The bird droppings had no scent except that picked up from the earth. Listening intently, the boy waited for the bird to return to his home for the evening. But listening for the bird and digging the surrounding debris at the same time found neither task accomplished. Finally the boy lay down on his back, feeling a little discouraged. With the sun behind the willows now, shade covered him, and in the dark he felt as though he may have blended into the ground himself. The boy tried to hold his breath silently and listen for the bird. All of a sudden other noises interrupted his intention of hearing wings in the air.

Far off, dogs barked. Some of his classmates had begun a ball game on the school ground. The quietness actually carried more noises than he really wanted to hear right now. The little creek seemed to roar over the pebbles that seemed now like boulders. The boy began to shiver in the shade and dampness of the decaying material. Without really thinking, his fingers began to twitch and move back and forth on his soft, worn jeans. He began to compare the softness of his jeans to the textures of the earth.

With eyes now diverted from the sky, the boy did not notice the flock of birds gathering in the willows farther down the creek. But then he heard the chattering and cackling before he saw them. (Uh! Oh!). Would the birds come near enough for him to watch? The flock took off and landed time and time again in rugged unison from the branches of the bushes to the ground. Off they would go to the other side of the stream and back again to peck nervously on the ground, seeming to just make holes, not really looking for anything in particular. The birds appeared to ignore the boy in general, but they did not approach either.

Not even conscious of his movements, the boy sat upright to better see the birds. His movements then caused the birds to rise off the ground as one body and swoop further away from his post. Realizing he was the cause of their flight, the boy vowed to be more still and lure the birds back to his spot. Was that possible? The boy was tempted to run after the birds and watch them swoop again. It almost made him feel powerful to see the birds react to his movements like that, but the setting sun made the boy remember his chilly back. He would come back the next day to try his luck at exploring the nesting area and the flock of birds. He was so sure there was more to be learned about the feather.

At home the boy told his uncle about the afternoon's exploration on the edge of the creek lying under the willows. The uncle listened as the boy related the story from start to finish. The part about the flock raising and swooping to the boy's movements prompted the uncle to speak. "It was possible," the uncle told the boy, "to have birds eating out of your hands in the wild. The pecking could really be felt on the palms of your very own hands. It would be possible to watch the movements of each individual bird; to see close for yourself the eye of the bird seeing your eyes, to feel their sharp feet on your upward-turned palms, to see the feathers intact on the bird's warm body, to know the weight of the bird, and to watch the tail feathers move in rhythm with the head bouncing up and down."

"How long would it take?" the boy wanted to know. Could he breathe and not frighten the bird? What food should he have in his hand? Would it hurt? Could they go right after school tomorrow? On and on the boy quizzed his uncle as to just how the birds that seemed so frightened of him today could be eating out of his hand tomorrow. And what of the feather he found on the path? Would he find more like that from these birds?

The next day the boy took the feather to school. First, he showed the feather to the boys in his class. As they were gathered around him, his teacher came and saw the feather, too. The boy had been hesitant to share his adventure with the teacher, but now, as he showed interest and asked the boy about the feather, the boy found himself telling the whole story over again. The boy could tell his friends were impressed with the attention his teacher paid to him and the feather. Confusion set in on the boy's face as the teacher continued to quiz and compliment him on his discovery. The boy wondered when the teacher would hush and return to the regular format of the school day. It was time to take roll. His feelings must have surfaced because the teacher quickly turned his attention to the girls' chattering in the back of the room. The boy returned to his seat.

Later, the teacher asked the principal if the entire class could visit the nesting area that afternoon. The boy was delighted, but, he stayed quiet in his chair. Oh, but if anyone could see his heart beating. Never before had his class gone outside during school hours for anything but recess and games. What would it be like to walk down to the creek with his class and his teacher during the afternoon when they were supposed to be working on geography and science and music and health? Would the mint smell be the same with fifteen fifth graders and a teacher there? Would the birds even come in sight with that many people around the willow bushes? Questions like this briefly crossed his mind, but his excitement at returning to the nesting area rose above any caution he had about other people being there. With the feather tucked safely and proudly in his pocket, the boy forced himself to return to his book, but his eyes did not see the pages and his ears did not hear the teacher.

Finally, it was time. The teacher talked to the class for a few minutes about how to walk. Walk? Did they have to walk? The teacher reminded the class of excited 10-year olds that the place they were visiting was really a home for many things. He asked the students to behave as though they were visiting a friend's or a relative's home. He reminded the students to watch where they step and to be careful not to shout or scare anything from the creek.

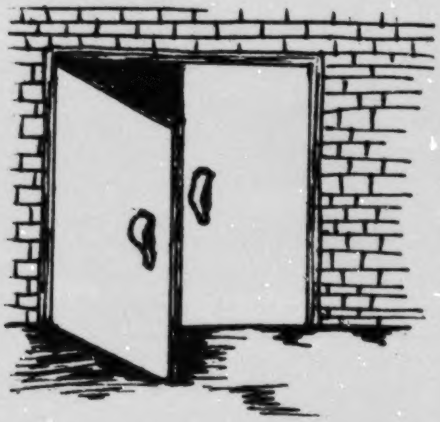
The teacher had never taken the students outdoors for a class before. His second year of teaching helped him gain confidence in his teaching, and how to work with the children. He was more familiar with their ways now and knew they were more familiar with his. He was getting to know the community, both its families and its physical area. He had spent many hours walking and hiking, photographing everything that caught his eye in an attempt to record his feelings and moods during these first years of teaching on the reservation. Sometimes the enormity of local problems depressed him...sometimes he missed the big city-type things he knew his friends were enjoying. No more quick hamburgers on the way to the movie; no more movies unless he drove 60 miles to the nearest theatre. But losing all those things was worth the friendships he made with some of the parents and students here. He observed the family closeness shown by this tribe; and reflected on his own family.

The teacher felt as if he were learning much more than he was teaching the students. He was learning about a group of people some of his college friends had never even heard of before. He was learning about religion in a way that was more meaningful to him personally than any of the Sunday school classes he and his sister struggled through in their growing years. The teacher was enveloping himself in learning and participating in the community activities.

Some things he did not understand. The role of the medicine man still baffled him, but the teacher accepted it as something he was not yet ready to understand. Like the child waiting to develop in order to learn more, he was waiting to develop in order to learn more, too. Anyway, today was going to be one of the many tests and experiments he put himself through to become a better teacher.

As usual, a change in the daily schedule affected the class. They were excited. If only he could use their excitement in a way to teach them about the surrounding area, it would be well worth the anxiety and extra effort of going outside. When the boy brought the feather to school, the teacher suddenly felt as though this were the very opportunity he had been waiting for to get the kids involved in the way he sought for himself.

One of the benefits of this small school was the relationship he had with the principal. The principal had become a friend and there was no red tape to go through to get permission to take the kids outside today. The hot fall sun felt good as the school door swung open to let the class and the teacher out into the world around them.



GRADE LEVEL: All
Time: One half hour

"We love quiet: we suffer
the mouse to play; when the
woods are rustled by the wind,
we fear not."

Indian Chief to the
Governor of Pennsylvania
1796

SENSORY WALK

NOTES TO THE TEACHER:

A sensory walk can be conducted every time you take your students outside. The walk can be conducted in the classroom by asking different questions. Try the sensory walk in a variety of environments and seasons. This activity is designed for the students to become familiar with the place and things they are studying in a different way.

Have the students stand in a single file, placing one hand on the shoulder of the person in front of them. Ask them to use only one sense at a time. They will use their sense of smell, taste, touch, hearing, and lastly, their sense of sight.

Lead the students with their eyes closed a few steps and ask them to concentrate only on hearing, letting the rest of the body relax. Stand quietly to give the students an opportunity to listen.

Move forward a few more steps, then ask the students to concentrate on one of the remaining senses, one at a time. Leave the sense of sight for the very last.

Sometimes the English language is not as precise as other languages and it may be difficult to express the wholeness of feeling in being there. Sometimes the only language is experience; and experience does not always translate into words. You simply have to immerse yourself to know. Experience is not easily interpreted truthfully; and the truth, when it comes in words, is always a matter of interpretation.

- What are native words for:

  Nature ______________ Land ____________________

  Environment ___________Feeling_________________

  Experience____________________________
- What are some other ways to communicate an experience?
- Think back a hundred years ago. What people lived here then? How did they depend on their physical senses? How is it different today? Why has it changed?
- Do you know anyone who cannot hear or anyone who cannot see? How is their world different?

- If a person from your tribe a hundred years ago could not hear, how would you (the student) describe what you hear to them?

So far you have helped your students

- understand trust, risk, acceptance, curiosity, and responsibility in environmental learning situations.
- be more aware of their physical environment through use of their basic senses.

GRADE LEVEL: Primary
Time: One half hour

Equipment:

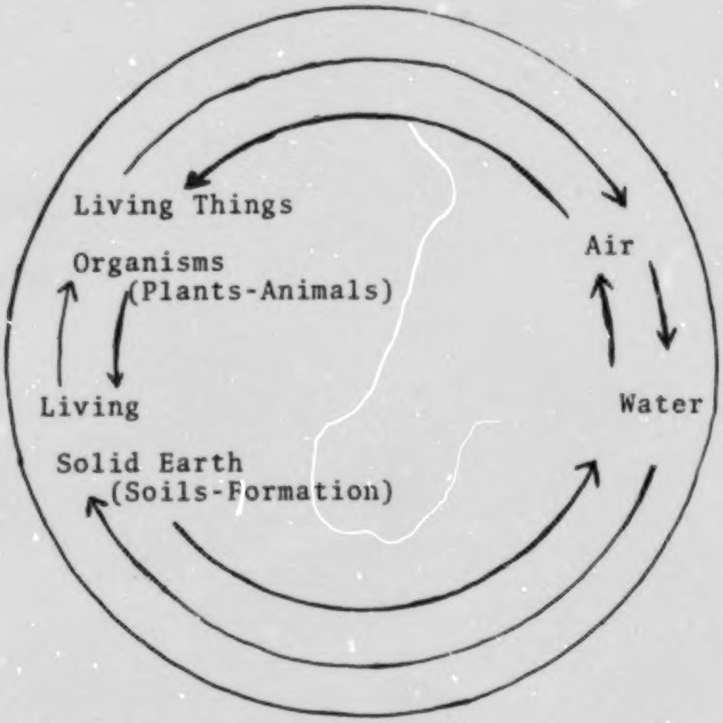
- wooden box containing flask of water
- rock

> You have noticed that everything an Indian does is in a circle, and that is because the power of the world always works in circles, and everything tries to be round. In the old days when we were a strong and happy people, all our power came to us from the sacred hoop of the nation, and so long as the hoop was unbroken, the people flourished.
>
> Hehaka Sapa, or Black Elk
> Oglala 1900's

THE LIFEBOX

NOTES TO THE TEACHER

- Pass the box for students to take turns looking in it. Everyone should have a chance to see what is inside.
- Ask students to name the four basic needs for all life -- water, soil, air, sun.
- Help students to realize that two of the elements are in the box. Air was always there, and when they opened the box, sunlight came in.


Living Things
Organisms
(Plants-Animals)
Air
Living
Water
Solid Earth
(Soils-Formation)

NATIVE
AMERICAN
CIRCLE
OF
RESPECT

So far you have helped your students learn the basic needs required for all life.

GRADE LEVEL: Intermediate
Time: One hour

Equipment

- hand lenses
- small nails

FOR LICHEN-LIKERS ONLY

NOTES TO THE TEACHER

Find an area with lichen growing (on rocks, trees, or fallen logs).

There are 16,000 different species, which are classified into three types: crustose (crusty), fruticose (shrubby), and foliose (leafy). All three are common. Crusty lichen form patches on solid rock and are often the first plants to colonize on barren, rocky soil. The shrubby species such as the beard lichen, hang from branches of trees. Leafy lichens grow on tree trunks and rotting logs and rocks. They make secreting acid.

Lichens have adapted amazingly well to survive under adverse conditions. During water shortages or in scarce areas, lichens may become dormant and remain in that condition for extended periods of time. Some lichens can actually live on occasional dew. Unlike most plants, lichens are not affected by the strong ultraviolet rays of the sun which allow them to flourish even in the high mountains.

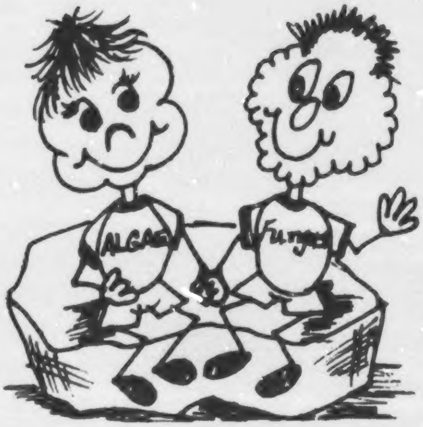
Lichen is formed when the four basic elements meet. Lichen is an example of symbiosis or a symbiotic relationship. It is the result of two other plants joining to form an entirely new plant!

Fungus (white)

Symbiotic Relationship
Lichen

Algae (green)

Algae--Sunlight
Algae--Air
Fungus-Water
Fungus-Minerals



DISCUSSION AND QUESTIONS

- Explore the kinds of plants growing on the rocks and trees.
- These plants are called "lichen". How many different kinds are represented?

  Colors? Shapes? Sizes?
- Direct students to look for roots, leaves, stems, seeds (without destroying the plants).
- What color is the underside of the plant? Color of the top of the plant?
- Discuss the evidence found so far. How do lichens live?
- Where do the minerals come from?
- How does the plant get its water? (Examine small cups on lichen).
- How does sunlight affect the lichen? Are there more lichen growing under the rock than on the open surface?
- Air is always there. Can you remember seeing lichen on trees and rocks in the city where there might be pollution or a large amount of disturbance?
- How does lichen affect the surrounding environment? Consider and discuss:
  - Lichen catches and holds water (frozen water helps break down rock.
  - Lichen dies, decomposes.
  - Lichen traps the energy of the sun.
  - Lichen releases nutrient minerals from the rock.

- How does it grow? (Lichen grow out from the center - sometimes taking 100 years per inch on dry rock).
- Using your fingers, measure the age of the lichen here. Which is the oldest?
- Watch where you walk. How many years would it take to replace damaged lichen?
- Lichens grow very slowly. What does that tell you about the amount of energy they use up? Compare that to your own body and the amount of energy you use.
- Can you think of any other living things that have a symbiotic relationship?
- What is the main purpose of lichen? Why is lichen called the "pioneer plant" or the time stains?
- Are there any medical uses for the lichen?
- What are some of the words in local native language for the elements identified here?

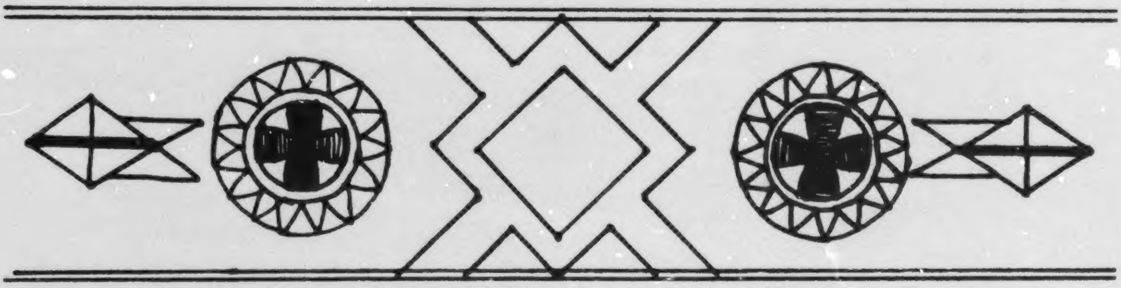
  water ________________ soil ________________

  air ________________ sun ________________

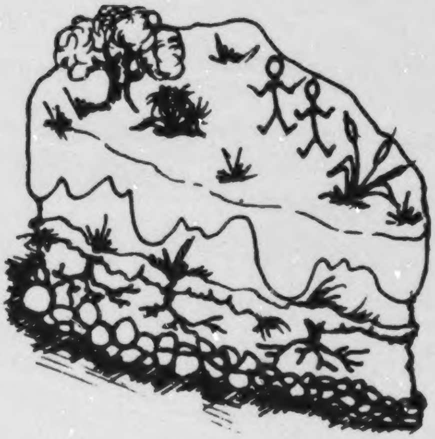
- Does the tribe place more importance on one element than any of the others?
- Draw a circle including these elements. Where is each placed?
- How are each of these elements used differently then?

So far you have helped your students

- understand that there are important relationships between living things and their physical environment.



GRADE LEVEL: Three
Time: One half hour



AN EARTH CAKE

NOTES TO THE TEACHER

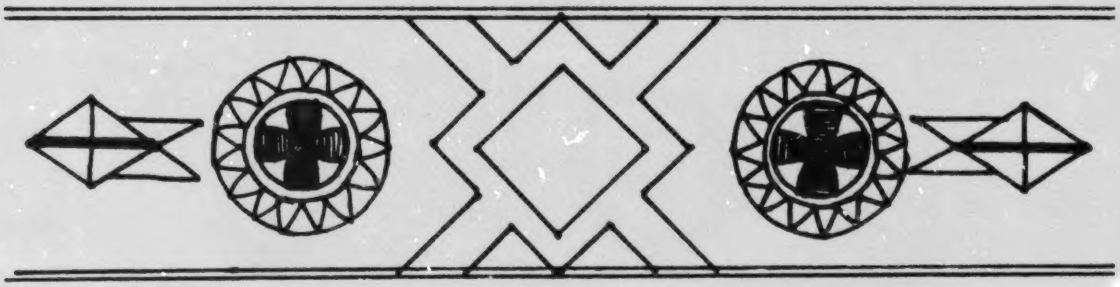
Find a cut in the soil, revealing the layers, vegetative contents, and other things present under the ground. Take your students to the soil cut.

- Have your students observe the cut in the soil. What do you see in the soil? What are the ingredients in layers? Why are some layers thicker than others?
- Have the students feel and taste the soil layers. Are there differences? What makes them different?
- Look at the top of the earth cake. Are there decorations? Is there any frosting? How do the decorations affect the layers?
- What are some uses for soil other than growing plants?

- What were the different colors of soil used for in the old days?
- Are there native words to describe the soil?
- Inquire of the elders as to any of the traditional thought and beliefs about the earth as mother.

So far you have helped your students

- realize that many elements are contained in soil.
- consider the fact that all growing things have an effect on the development of soil.



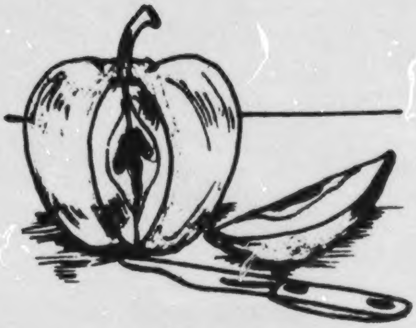
GRADE LEVEL: Intermediate
Time: One half hour

> "The Great Spirit is our father, but the earth is our mother. She nourishes us; that which we put into the ground she returns to us likewise. If we are wounded, we go to our mother and seek to lay the wounded part against her, to be healed....."
>
> Bedagior Big Thunder
> Wabanakis Nation
> early 1900's

THE EARTH AS AN APPLE

Equipment Needed:

- Two whole apples
- One sharp knife
- Sheet of paper
- Ink
- World Atlas



NOTES TO THE TEACHER

- Slice the apple into quarters. Set aside three of the quarters. These represent the oceans of the world. The fourth quarter will represent roughly the land area.

- Slice this land quarter in half (giving you two 1/8 world pieces). Set aside one of the 1/8 pieces. This is land which is inhospitable to people -- the arctic, the antarctic, the true desert, the extensive swamp areas, the very high mountain areas. The other 1/8 piece is the land area where people can live, but not necessarily grow the foods needed for life.

- Now slice this 1/8 piece into four thin sections, giving four 1/32nd pieces. Set aside three of these pieces. These are areas too rocky, too wet, too hot, too cold, too steep, or with too poor soil to actually produce food, and also they include the areas of land that could produce food but are buried under cities, highways, suburban developments, shopping centers, and other structures that people have built.

- This leaves us with a 1/32 slice of the earth. Carefully peel that slice.

- This tiny bit of peeling is the skin, the very thin skin of the earth on which mankind depends. It is a quite fixed amount of food-producing land, and when there is a fixed resource base and an ever-increasing number of people trying to feed themselves from that fixed base, each person's portion becomes smaller and smaller.

DISCUSSION AND QUESTIONS

- What are some thoughts about world power this demonstration brings to mind? Why do conflicts exist over resources like oil or water?

- Obtain a world atlas from the library and look up the following information:

  - The three most populated countries. (Number of people)

    ____

    ____

    ____

  - The three largest countries. (Land area)

    ____

    ____

    ____

  - The countries of the world that export oil.
  - The countries that import oil.
  - The countries that export wheat.
  - The countries that import wheat.

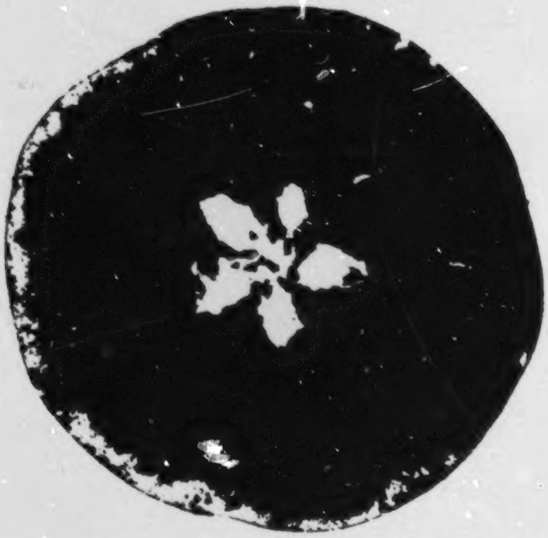
- What other information is important for world wide assessment of natural resources?

- How much land does your reservation cover? Go through the lesson plan again and use your reservation as the whole apple.

- Is there land covered by water? Mountains uninhabitable? Swamp? Desert?

- Try to determine the amount of land available for growing food if your reservation were to export the products.

- This may require going to the tribal offices to research the reservation and the land therein. How many people live on the reservation?
- Cut an apple horizontally through the center. What design is there?
- What significance does the star have for them and their tribe?



So far you have helped your students

- to relate that land area to the population that tries to support itself on that area.

GRADE LEVEL: Third
Time: One half hour

"This is a plant so new and small that
hardly shows in the moonlight at all.
This is a rabbit, hopping, hopping.
He's hungry for the plant and now he's stopping.
But, there sits an owl with his big round eyes.
He's hungry for the rabbit and silently flies.
But, there sits a coyote, not missing a sound,
Ready to pounce on the owl when he strikes
   the ground.
But there comes the rancher, looking things over.
He gives a whistle to his dog, Rover.
So, the coyote slinks away, the big owl goes,
The rabbit hops home, and the plant just grows."

Author unknown

HAVE YOU THANKED A GREEN PLANT TODAY?

NOTES TO THE TEACHER:

Go outdoors to an area of abundant vegetation. Read the above poem.

- Ask students to explore the type of plants in the area. How many different kinds are there?
- Where do plants come from? What eats the plant? What eats the rabbit? What eats the coyote? Many answers are possible.
- Have the students role-play the poem, being different animals.

QUESTIONS AND DISCUSSION

- What have you eaten today?
- Where did the food come from? Where was it grown or raised?
- If meat is listed, what does that animal eat?
- What is your shelter? What is it made of? Where did it come from?
- What are your clothes made from? Even man-made fibers are derived from petro-chemicals, which inturn came from oil which was formed millions of years ago by dead and decaying plants and animals. (Green plants give us food, clothing and shelter).
- How were animals used by your tribe one hundred years ago?

  (Interview an elder of your tribe and inquire about the use of animals. Bring a story back to class and illustrate it.)*
- Do the same with plants. How were plants used for medicine? Are there any culturally significant plants for your tribe? Why is the plant special? **

  (Share the story with the entire class. If it is appropriate, invite an elder to class to relate a story about the special significance of the plant).

---

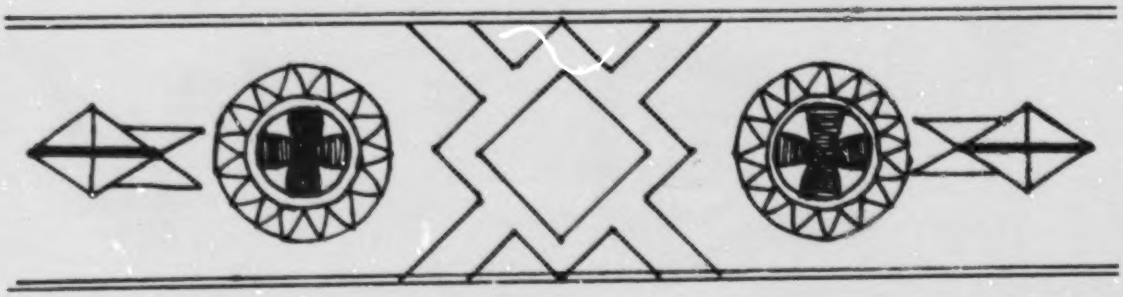
* "How Deer Hide Was Tanned", "Buffalo of the Flatheads" Level IV. "Our Homes Then and Now", Level IV of the Indian Reading Series.

** Read "Baskets and Canoes", Level IV of Indian Reading Series.

Key Concept: Plants can live without animals; but animals, including man, cannot live without plants.

So far you have helped your students

- appreciate the value of plants in the environment.
- establish the relationship of man to plants.



GRADE LEVEL: Intermediate
Time: One half hour

"Did you know that trees talk? Well, they do. They talk to each other, and they'll talk to you if you listen....... But I have learned a lot from trees; sometimes about the weather, sometimes about animals, sometimes about the Great Spirit."

Tatanga Mani, Walking Buffalo
Stoney Indian
Sometime in late 1900's

Consider a tree and all the life it can harbor from its roots to his highest branches. The tree influences the weather under it. Even in death, the tree gives life.

THE VILLAGE HOUSE

NOTES TO TEACHER

You will need at least one tree.

- Have your students lie on their backs looking up with their feet pressed against the base of the tree as spokes in a wheel. (They might pretend they are limbs or roots of the tree.)

- While they are lying on their backs, pretend that this tree is a village house, with a basement. Where is it? Does anyone live there?

- The ground floor has carpeting. Can you feel it? What makes the carpeting? Can you feel it? What makes the carpeting? Who lives here?

- There are no elevators in this village house, but the tree trunk serves as a stairway. How? Does anyone live on the "stairway"?

- There are many floors in this village house. Who lives on these floors?

- The top floor forms the canopy of the forest. Many trees together can regulate the temperature of all the other floors, letting in sunshine and precipitation. Does anyone live in the top floor of this building?

- What are some special traditional thoughts about trees from your tribe?

- Is there any special ceremony that used to be done when taking a tree?

- How are trees used on your reservation? What kind of trees are there on your reservation?

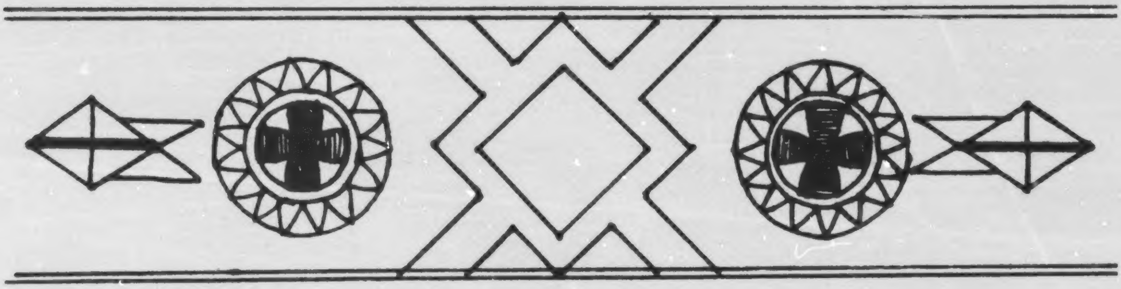
- Think back a hundred years ago. Were there more or less trees, or about the same?

- What are some of the native words to describe trees in your language?

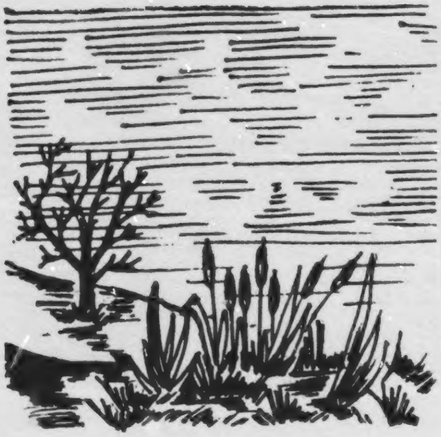
- Relating back to the lesson plan previous to this one on the earth cake, how are these two elements dependent on each other?

So far you have helped your students

- look at a tree as a community.



GRADE LEVEL: Intermediate
Time: One hour



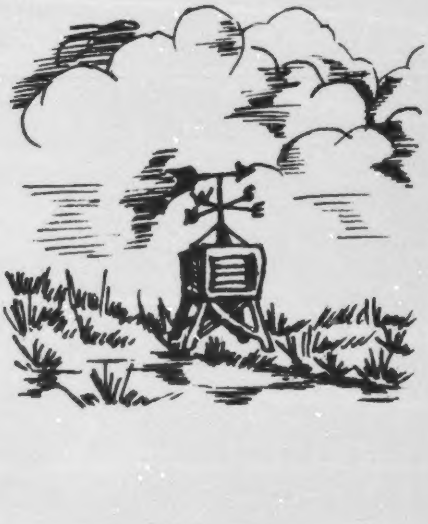
"The wind that makes music in November corn is in a hurry. The stalks hum, the loose husks whisk skyward in half-playful swirls, and the wind hurries on.

In the marsh, long windy waves surge across the grassy sloughs, beat against the far willows. A tree tries to argue, bare limbs waving, but there is no detaining the wind.

On a sandbar there is only wind, and the river sliding seaward. Every wisp of grass is drawing circles on the sand. I wander over the bar to a driftwood log where I sit and listen to the universal roar, and to the tinkle of the wavelets on the shore. The river is lifeless; not a duck, heron, marshawk, or gull but has sought refuge from wind."

Aldo Leopold
A Sand County Almanac

MINI-CLIMATES



Equipment Needed:

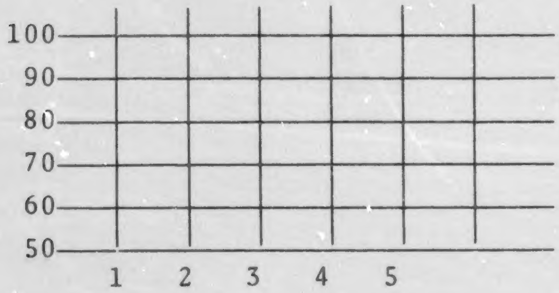
- Wind vane
- Air, soil thermometers
- Rain gauge

NOTES TO THE TEACHER

Weather is with everyone every day. Awareness of weather can help your students plan their activities. It can help them understand the climate of their reservation. Use the equipment listed above all year long to record seasonal changes in the weather.

QUESTIONS AND DISCUSSION

- Ask students to share signs of weather predictions that elders in their tribe know about.
- What are signs of an unusually cold snowy winter?
- What are signs of a dry summer?
- What does the term "Indian summer" mean?
- Are there special traditions to welcome seasons?
- What causes seasons? Record the air temperature every school day at the same time each day for one week. Wait for three weeks and again record the air temperature every day at the same time of day for one week. Using graph paper, show the two temperatures.



- Do the same activity with the soil temperature. What is the difference between air and soil temperatures?

- What determines temperature? Explain to the students that the earth travels around the sun in a big circle. The earth is always tipped to one side a little. It takes a year for the earth to move all the way around the sun, but 24 hours or one day to spin on its axis.

- Use students to role-play the earth and the sun. Are there traditional dances depicting the earth and sun or seasonal changes?

- What causes wind? Explain to the students that warm air always rises. Cool air always flows down to take its place. This movement of the air is wind.

- Using the wind vane outside, determine if your school area is windy.

- The students have already learned that the sun warms the air. How does the sun affect wind? *

- What is rain? When water vapor rises from the earth, it cools. Tiny bits of water come together and form small drops. The clouds are made of these drops. The cloud moves around because parts of it are warmer than others. As the cloud moves, the drops bump and push against each other. As the drops touch they join together and become larger and heavier. Then they begin to fall.

- Record the amount of rain from the gauge. Keep track of the dates every time it rains.

- As seasons change, record how the plants near your school change. Use a camera to take pictures of the same plants during the different seasons.

* Read "Coyote and the North Wind" from the Northwest Education Laboratory Indian Reading Series.

- Compile a class weather notebook including:
  - Rainfall records
  - Temperature records of soil and air
  - Wind direction and speed
  - Traditional signs of weather
  - Pictures of traditional dances for seasons or weather.

So far you have helped your students

- to be introduced to elements affecting climate.
- to share traditional weather predictions and celebrations.

GRADE LEVEL: Primary
Time: One week

THE STORY OF WATER

NOTES TO THE TEACHER

Before starting this lesson, set a clear container of water somewhere in the room with no cover on it. Be sure it is in an accessible place but where it will not be spilled. Each day of the lesson, use a felt-tipped marker to mark off the top line of the water. No one should drink it or pour it anywhere. Then at the end, introduce the concept of evaporation along with the story.

Start this unit by inviting your students to follow the water pipes in their classroom through the school. Ask the custodian to help you with this activity.

Equipment Needed:

- Milk cartons for each person in the room (½ gallon size)
- Plastic wrap
- Rubber bands or tape
- Large wash basins
- Small clear pill bottles or containers with lids
- One large clear container
- Large chart paper

SOURCES AND USE OF WATER

Questions to explore with your class.

- Where does your drinking water come from?
- Where does it go when it goes down the sink?
- How do you get hot water?
- What happens under the sink when it is shut off?
- How does water turn to ice in the stream?
- How does snow turn to water?
- Do we drink the same water that is in the puddles?

Water in the classroom and the school should be the first place to explore. Have the custodian lead the students through the school to identify where the water pipes are located.

Where does the water go when it leaves the school? Have the custodian or other knowledgeable person explain to the class where the water that the school uses comes from and where it goes. Ask each child to go home and find out where the water comes from for their home. Where does it go?

The following day, make a list together on the board of all the ways we use water every day.

Examples

- brush teeth
- wash hands
- wash dog
- wash dishes
- wash hair
- wash clothes
- cook vegetables
- drink
- swim
- fish

- Try to have each child contribute to the list of ways in which water is used. Ask them to draw a picture of their favorite way of using water. Ask them to draw a picture of their family's favorite way to use water.

- Cut out pictures from magazines and let the students choose their favorite picture of water. Have pictures of lakes, rivers, swamps, etc. Also include pictures of kids washing, and various recreation pictures. Encourage the students to create a story around their picture.

- Make a map of the school water pipeline as an in-class joint project on big flip chart paper. Use directions to assist with identifying features from around the school. Where does the water pipe go near the principal's office? Remember the bulletin board in the front hall? Where is the water pipe from there?

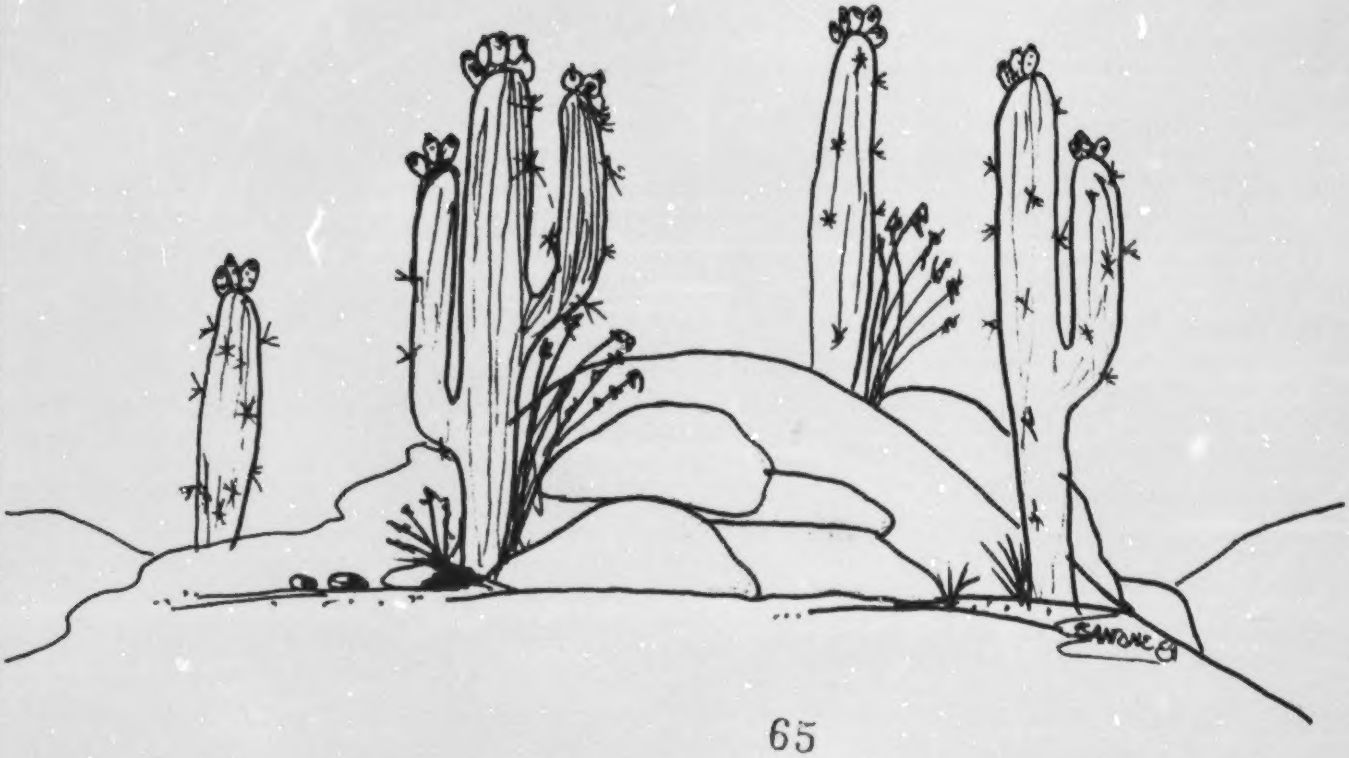
AMOUNTS OF WATER

After the students learn where the water comes from in their homes and in the school, have mapped the water lines, and have done stories about how they use water, then start on the amount of water they use for certain activities.

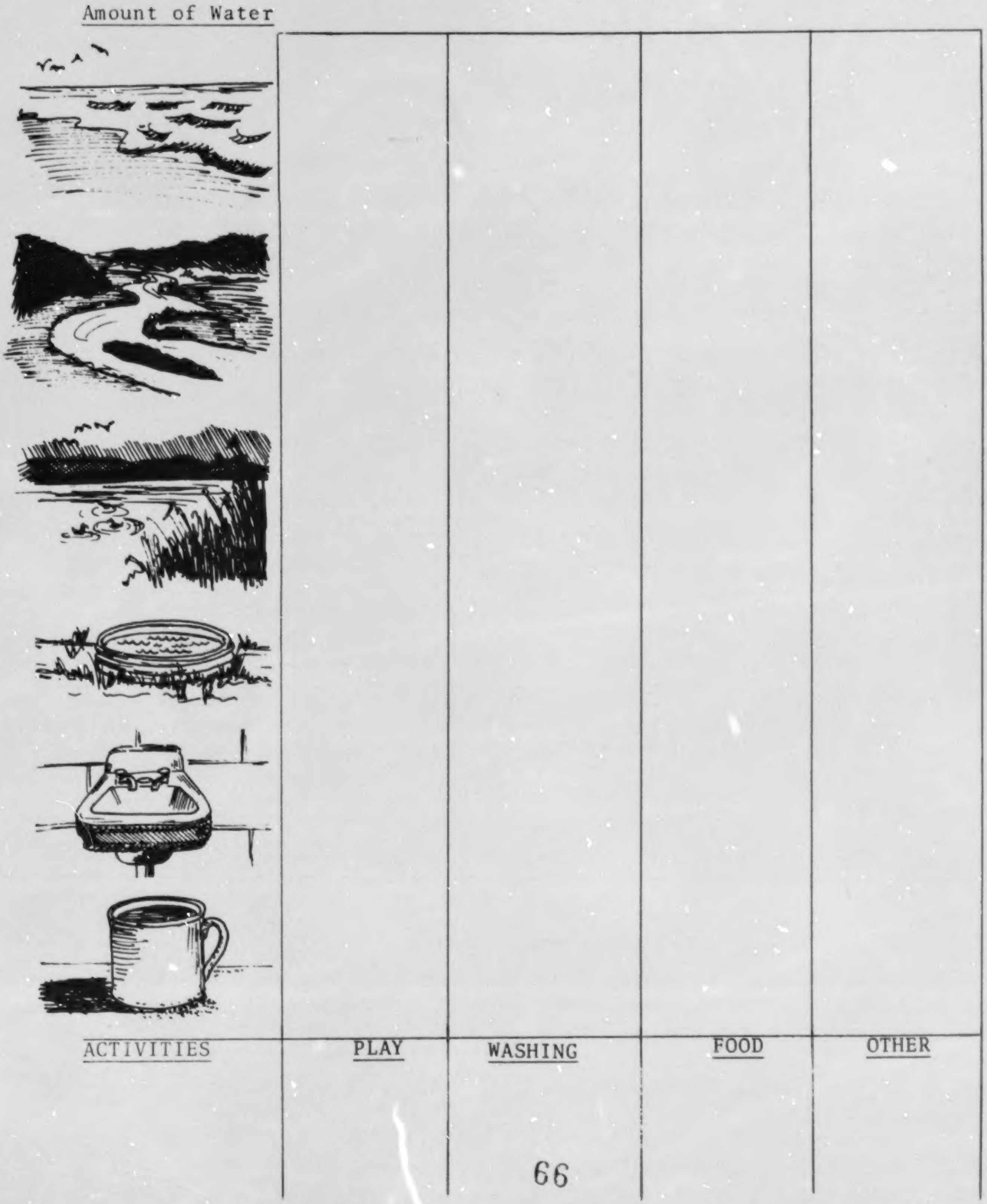
- Serve a pitcher of Kool-aid that requires a certain amount of water. Each student should be served the same amount in a paper cup. Point out to the students the amount of water it takes for a pitcher of water to serve Kool-aid to a certain number of children. How much water would they need to serve Kool-aid to the next grade if they had to add 20 students? Demonstrate that the amount of water used is relative to the number of students served if the same amount was served to each student.

- Put a stopper in the sink and ask some students to wash the cups they used. Some students will not participate in this activity so have them wash their hands when the cups are cleaned. How much water was used to wash the cups? A sink full? Or two sinks full? How much water was used to wash their hands? How much water does it take to wash their clothes?

- Make a chart for the children to fill in the amount of water needed to do their favorite things with water.



DIRECTIONS: Use this worksheet as a bar graph for the students to fill in how much water it takes to accomplish the activities they have listed.



- On two separate days, measure the amount of water each child drinks during school hours. Keep a pitcher of water on your desk and instead of using the water fountain, ask them to come to your desk for their drinks. How many times did you fill the water pitcher? Count the number of children in the room and show them the amount of water they drank in two days by filling a large bucket with the same amount.

- Ask them to guess how much they drink at home to add to that amount. Then suggest that if you had to give each person equal amounts of water, how much would each person get just for drinking water?

So far you have helped your students

- compare personal drinking needs for water.
- share some of their favorite things to do with water.
- become aware of the water system in the school and home.
- become aware that it takes varying amounts of water to do different things.

PLANTS AND ANIMALS USE WATER

Let's see what makes their homes in and around water.

If possible, visit a nearby stream or small body of water. Review all the safety procedures possible before leaving the classroom. This is a good activity for early fall or springtime, depending on the amount of water runoff possible in your area. Use common sense not to endanger the children. Even a watering tank for livestock will be appropriate for parts of this lesson.

Walking to the water, discuss the things they might find living near the water. Suggest some things to look for. When you reach the destination, have the children sit quietly and just listen and observe the activity at the water area.

1. Ask the children to lay back, close their eyes and listen to the sounds around the water area.
2. Then smell with their nose. Are there different smells near the water than away from it? Where does the smell come from?
3. Use all the senses.
4. Think of one of the things that they guessed might be living at the water area. Pretend that they are

that living thing and approach the water. Remember, it does not have to be an animal...it can be a certain kind of plant too, or a bug.

5. Have all the children approach the water in a cautious manner imitating the living thing of their choice. When they have gathered again, distribute the viewing boxes made from milk cartons. (Directions at the end of the lesson plan.) Each child should have one or work in pairs. Standing on the edge or kneeling on the bank of the water area, put the viewing box into the water and let the children see moss and algae or tiny bugs, or even rocks. If you use the viewing boxes, it is best to do so in shallow quiet water. A stream may be too strong for them to hold the boxes in the water and view.
6. Use large white tubs to hold water at the bank's edge and take an inventory of what lives in the water. Get samples from under stones and near the edge as well as from the bottom of the water. A stock tank will also have living organisms in it.
7. Have the children pick up the things they have found in the water. Did they find any eggs or tadpoles? Have they found just plant material? How about debris from other animals and plants? Did they find any seed pods?

8. Distribute to each child a small pill bottle with a snap-on lid. Let each child get his own sample of water from the area. Take some dirt materials from the stream also. Ask the children to set the bottles on a level area for half an hour or for the duration of the activity. Come back to them and witness the layering process of material in the water. Point out how different the water looks now compared to the time the bottles were set down.

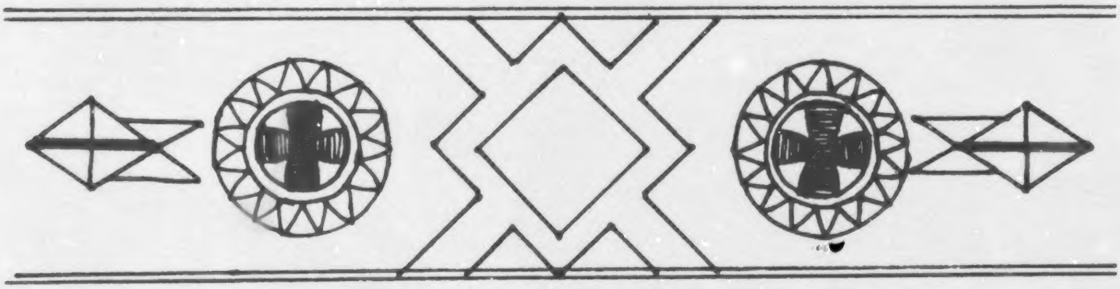
So far, you have helped your students:

- think about what living things are around water.
- look closely into the water to find living things.

Back in the classroom, lead a discussion on where water comes from.

- Where did the water come from in the area we just visited?
- Where was the water going downstream?
- What makes water? Can any more water be made?

Explain to the class that the water in the stream came from some place higher up the valley. It is on its way to the ocean. Use pictures of the ocean to show the children what it looks like. Explain that before it arrives at the ocean, it will probably be in a river somewhere first.



A DROP OF WATER

Here is a story about the life of a drop of water that lived on your reservation.

One day the air was cold way up high in the mountains. The clouds started to form above in the sky and snow began to drift down to the huge rocks on the mountainside. The snowflake was white. It was really just frozen water. The snowflake had a lot of friends gathered beside him and together they formed a snowdrift. They stayed together for a few months, frozen in stillness. Then one day the sun started to shine down more and more on them all gathered in the rocks. The sun began to make the snowflake feel warmer and slowly some of the friends started to trickle away. As more and more snowflakes started to melt, they went faster and faster down the mountainside joining many others on the way down. The flakes had turned into water!

Suddenly, they were falling off what seemed like a huge cliff and the noise other water drops made rolling over the boulders was a little frightening. But, there was nothing to do but roll along with the crowd. It seemed they passed all sorts of interesting things on the way to ... where were they headed?

They passed pine trees, and birds delicately dipping in a stream. They rolled over trout with their rainbow colors and hit rocks with all the force they could muster. The water drop was happy bubbling along when all of a sudden, right before him, was another huge fall. The water drop had gone over a dam! He went crashing to the bottom and felt squished up against something very hard. The noise and the roar all his friends made at the bottom was like nothing ever heard before. Whew! That was over and now they were calmly floating down another stream. This was easy. The sun again beat down on the little drops of water. The one drop of water we are following noticed that slowly some of his friends were starting to drift upward. The little drop feared to look up but somehow he knew the sun was doing it to the other drops. Nobody seemed to notice, it was so slow. The little drop of water tried to push deeper into the stream where it seemed to be cooler, hoping to avoid the sun and what was happening to some of his friends. The little drop did not know that the sun was actually just making little clouds for the drops of water to hide in until it was time for them to fall again!

The little drop of water spent the rest of his life making his way to the river and the ocean. There were lots of adventures along the way with all his friends.

Eventually, the little drop of water went the way of all little drops. It was open to the warm sunshine and allowed to drift upwards to the clouds and join friends of long ago to once again renew the vital strength to bring rain, snow, sleet, or hail to the ground below.

To The Teacher:

Read to the class "Paddle to the Sea" by Holling C. Holling.

STUDENT DISCUSSION QUESTIONS

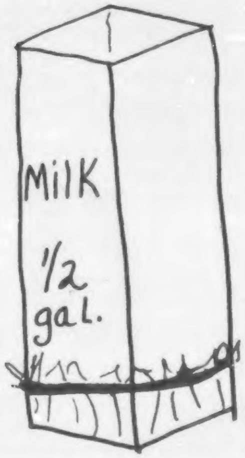
- Share stories about the rain that you have heard from older people in your tribe or others on your reservation.
- Find out from your relatives how water influenced the life of long, long ago. How did people wash their clothes? Where did the drinking water come from before there were any water pipes? Where did people wash their food? Have you ever been camping? How did you use water then? Can you think of ways people had to plan their day around the use of water?
- Draw a picture of water's most important use long, long ago.
- Remind the children that from now on every time they have a drink of water, wash, or swim, to think of a drop of water and all its adventures from the clouds to the ocean and back again.

End the session with a fresh glass of water for each child to drink.

Spend some time at the end of this water lesson discussing the entire cycle. First cloud to snow, on to snowdrift, and so on. You may wish to have the children put on a play for another class. Have one child be the drop in the cloud, by standing on a chair. Another child can be part of the snowdrift and melt down to the stream, and on to the ocean with each child being a part of the cycle. Find some appropriate music in your school to go along with the water play. Use tapes of water sounds. Maybe the tribe has a celebration dance or music for rain or weather. Use all the effects possible to involve the children. Perhaps one of the children could narrate the play about water.

DIRECTIONS FOR THE MILK CARTON VIEWER:

Use a half gallon container (plastic coated) empty of milk. Cut off the top and bottom and discard. Use clear plastic wrap to cover one end of the viewer. Attached it with tape or even a rubber band. Each child can have his own viewer or work in pairs. Make this an art project before the water session begins. Ask the children if they have any ideas of how people looked in the water before plastic wrap was invented.



GRADE LEVEL: All
Time: One half hour

THE WEB OF LIFE

(a demonstration)

Material Needed:

- Cards with different animal names (or pictures) on them. Plant eaters (herbivores), some meat eaters (carnivores), some insect eaters (insectivores) and some that eat almost anything (omnivores). A total of seven animal cards is adequate, one of which should be a person.
- A card for soil, water, sun, air, plants.
- A large ball or cone of string, and a pair of scissors or knife, and a roll of masking tape.

NOTES TO THE TEACHER

If this lesson is used with primary students who do not read, use pictures and introduce the names as appropriate.

WHAT TO DO

1. Arrange the group in a fairly compact body, so that when the strings are run, almost everyone (even those not holding cards) will feel trapped in and part of the web as strings criss-cross under their noses and behind their ears.

2. Place a chair or stool on a small table up front -- high enough so that everyone can see it clearly.

3. What do plants need to live? As the answers of water, soil, air, and sun come out, stick those cards to the legs of the chair with tape. Then, on the top of the chair, tape the PLANT card.

4. Ask for (or assign) a plant-eater from the students. Give that card to a person. State that the string will show what the animal eats, and/or what eats it. Run the animal-plant string. Cut it, and tie it to the chair top. Each time a string is run, tied, and cut, ask the person to pull it snug, so that the web develops it as a taut web, and not a bunch of limp strings.

   (Caution: knowing the number of animal cards you have, plan to place them in the audience so that they will be in an arc, or even a semicircle, so that strings will not run behind any animal, nor right over them).

5. Put out another plant-eater card. Run its string. What situation now exists? (It is competition for the same plant base). Ask what could happen. Ask how nature usually prevents this from happening (the need for meat-eaters).

6. Put out a meat-eater card. Run strings.

7. In the same way, one at a time, put out the other cards and run the strings. From here on, the order of the cards does not matter, except that the MAN card should be last.

8. Now ask what happens if one entire species of animal is wiped out--by such things as pesticides. Ask the person holding that card to put his string-holding hand forward so that his strings go limp.

9. Now inquire what the consequences would be to others in the web. You will find that there is always someone or some situation that needs that animal--so tell that their species will survive and have the students snug their strings again.

10. Do the same thing as in No. 9 for each animal in turn, except MAN. You will find each of them has a purpose--others depend on it.

11. Now have MAN make his strings limp--as would be the case by man wiping himself out by his masterful technology. Inquire if the animals of the web would miss man... really miss him. Could the web operate without MAN? Do tribal traditions prescribe a role for people in the web?

12. What are the names of the animals and the different elements used in the web in the tribe's native language? (Use those names instead of English).

So far, you have helped your students

- develop a web of string to show relationships among animals.
- realize that he or she is part of that web, affects that web, and is affected by that web.

GRADE LEVEL: Six
Time: One week

"An omen is an experience that interprets all events that follow it and reinterprets everything that went before. Good medicine, bad medicine, and omens change our understanding of our relationship to the world. Nothing is ever exactly the same once you have experienced an omen."

Tom Brown
The Tracker

THE ANIMAL WORLD

NOTES TO THE TEACHER

This unit is an investigation into the world of animals; where and how they live. Every time we enter the outdoor classroom, whether it be during school hours, or time on your own of reflection or recreation, always expect an omen. Your senses will be sharpened, expecting something great at every encounter. And if something great does not srike you, something else will. All of us have had the feeling that something was just right. A door in your mind opened, a light came on, and the truth was revealed in ways you never expected so simply.

The animal world exists within our world, yet it is different in so many ways. During the course of this unit, we will approach this world in a new and different manner. As the hunter in your past stalked the animal, and the woman sought quality hides and feathers, we will approach in a manner perhaps put aside for the convenience and comfort of humans. Is there a word in your tribe's language to describe the environment around a living thing as that creature experiences it? There is no English word that stands for the world as a creature experiences it. Words such as "nature", "experience", or "world" do not communicate this individual view. The Papago's have a word that stands for each creature's unique perspective on its environment. The word is "himdig". It refers to how an O'odhom sees, feels, thinks, and lives. A unique creature (creator) special to itself. We are certain that each tribe has a word like "himdig".

For example, the himdig of a person is different from the himdig of a bee or a horse. It is difficult to understand the himdig of creatures that have different senses and sizes from ours. It is also tempting to interpret animal life in terms that we are used to. Use caution to work slowly into himdigs of animals. Patience, and silence is necessary. What are some things your students have already done in this handbook that will help them carry out the investigations?

When you have mastered the task of observing and understanding himdigs of different animals, it will be time to meet the challenge of detecting personal quirks that distinguish individuals within a species. The movement and behaviors of animals is as full of individual qualities as is the movement and behavior of people.

So your class wants to learn about birds. One way to learn about a bird is to get a cage, get a bird, and bring him into the classroom for constant observation. But is that realistic? Will the things you learn about the bird be valid for the entire species? No...a bird in a cage is a bad choice for study.

The logical way to learn about a bird or any animal is through patient observation. The rewards are reaped in magical moments of awesome closeness with a living creature. To move in close, to lie in the grass barely breathing, to capture for a moment the joyous feeling of many creatures living together in balance and harmony is the objective of this unit. Move quietly, move slowly, move with the flow and pulse of living things around you. Blend with the living things and become a part of them. To do this, you must feel.*

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* Read "White Rabbit" Level V and "Running Free" Level IV of the Northwest Education Laboratory Indian Reading Series to your students.

- Set the stage for this unit in the classroom by discussing pets of the students -- basic questions such as what the pet eats. Ask the students to record the animal's behavior for a week at certain times of the day when the pet is around them. Evening seems the natural time, but if there are students that are early risers, ask them to observe their pet for an hour in the morning.

- Have the students contribute to the kinds of questions that will be on the observation sheet. Leave room for personal comments or stories about the pets. Have the class categorize the pets and make combined charts.

- Display the charts in the classroom along with pictures and stories about the animals.

OBSERVATION SHEET

Kind of Pet

Name Age

Other pets in family

DAY OF THE WEEK

Kind/amount of food

Source of food

Hours of sleep a day

PLAY ACTIVITIES

- Where does the pet go for comfort if needed?
- How does the pet respond to other family members?
- How does the pet respond to other family pets or neighbors?
- Is the pet male or female?
- In what way does the behavior of your pet change when it wants something (food, scratch, toys?)

COMMENTS

The week following the observation and data recording of each pet will be spent with the students practicing putting themselves into the himdig of the pet. What are some suggestions your class will have regarding this exercise?

- How can you understand the himdig of a dog? What are the senses of a dog? Does he have great eyesight? How is his sense of smell? Does a dog survive by his sense of touch?
- Accentuate on the sense your pet uses most. Try to be in his world by trying to sense the world the way he does. He is at a different level than the students. His eyes view his himdig in a different way. How does the pet dog see the kitchen table? In order to more fully understand the dog, it will be necessary for you to see the table and all the other things around the dog as the dog sees them.
- The dog's brain is different than your brain. The dog has different priorities in his life. While you may rush home from school to play a favorite game, the dog may rush home for a completely different reason. The dog's tongue is also, of course, very different, as are his stomach and his nutritional needs.

This is a week for some interpretations from the pet's point of view on the world around us. It will be impossible to literally enter the himdig of the dog, but the pet owner will learn a lot about his pet from the attempt. Perhaps the student will not only learn about his pet, but as a result of this study, may change the student's own behavior toward the pet. How is this important in the study of animals in the natural world?

Encourage the students to give themselves over to their experience and imagine worlds as foreign as any space or fiction story. Focus on three general aspects of animals' experiences. One aspect is locating oneself in space; because of size, our space is different than that of an animal. A second aspect is growth, change, or time. And the third aspect in animal experience is developing a way to respond to threats, friendships, or food. And so, space, time and response are three central aspects of the way all animals live their lives. Through understanding how these are organized by particular animals, it is possible to understand them better. This means that we have to disorient ourselves--to give up our own usual sense of how time flows and what distance means and of what is threatening to us. To become close to other worlds, is to give up our own for a while.*

Many Indian dances imitate lives and actions of animals. How will you use this lesson if a student does not have a pet at home?

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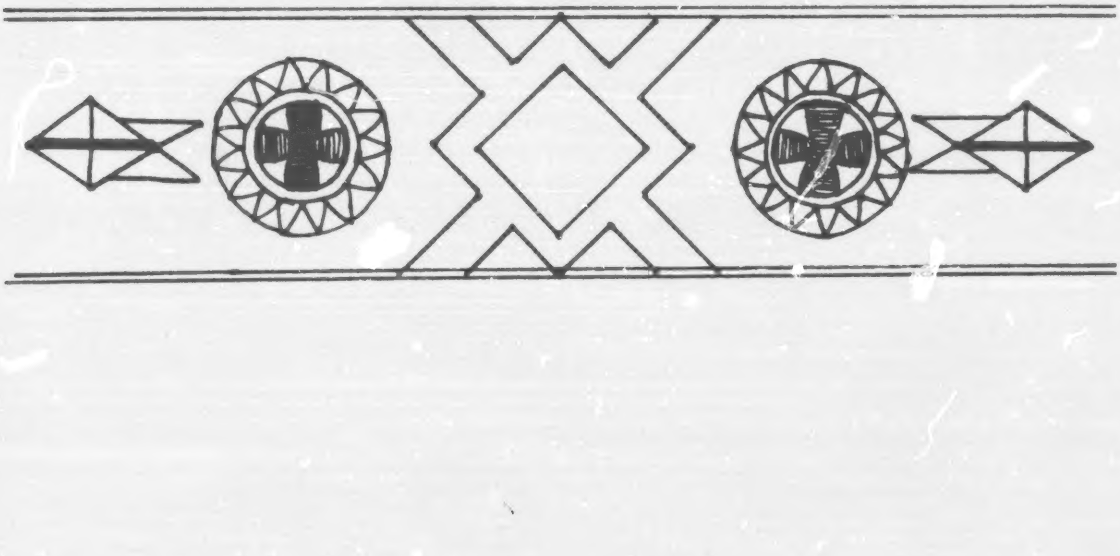
* Read "A Fishing Excursion" Indian Reading Series Level V and "In the Land of the Salmon" Indian Reading Series Level VI.

So far, you have helped your students

- practice observation, recording, and categorizing of familiar pets.
- communicate about their pets by written or oral stories with related art work.



GRADE LEVEL: Six

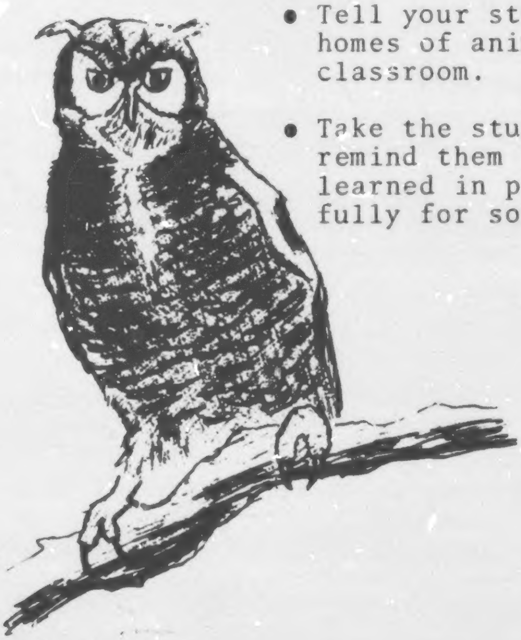
Time: One hour a day for
two weeks

ANIMAL HOME

NOTES TO THE TEACHER

This lesson will help students understand the following terms: habitat, territory, niche, and food chain. All the previous activities will be used as reference during this activity. These activities are best conducted outdoors in a natural setting. It may be helpful to contact a local specialist in animals, like the State Game and Fish Commission, or the Bureau of Sport Fisheries and Wildlife in the U.S. Department of the Interior. Also, there may be a wildlife biologist on the staff of your tribal government or on staff with the Bureau of Indian Affairs.

- Tell your students they will be studying the homes of animals that live in the outdoor classroom.
- Take the students out to the study area and remind them to use observation skills they learned in previous activities. Listen carefully for sounds of animals.



QUESTIONS AND DISCUSSION

- What are the sounds that you hear? What predictions can you make as to what animals make the sounds?
- Can you find evidence to prove your predictions? Look around your chosen area and list all the evidence you have found. Compare with others in your class or work in teams.
- Of all the animals that your class heard, saw, or found evidence of in your chosen area, choose just one animal to research further. Find out all about the animal.
- What are some of the previous lessons you have done that will help you know how to find out about the animal?

- Put yourself in the animal's role:
    - What would you eat?
    - Where would you sleep?
    - What is the danger for you?
    - What animal might eat you?
    - Where would you go for water?
    - Where would you hide?
    - What would you do in the winter? In the summer?
- As a group, write a complete description of what it would be like for an animal living here. Be sure to include how man would treat the animal. Include illustrations in your story, and also talk about the physical structure of the animal and how its body helps it live where it does.

NOTES TO THE TEACHER

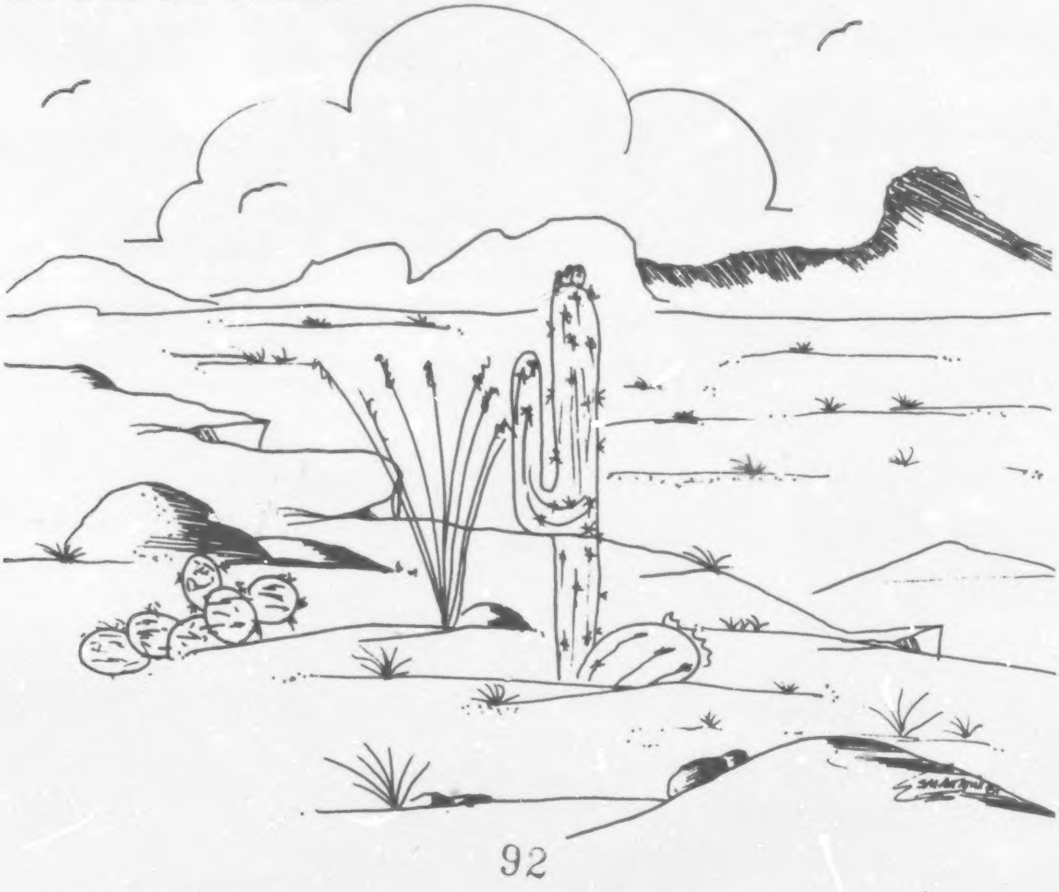
Looking into the natural area a little deeper, divide the class into three teams: an underfoot team, an eye level team, and an overhead team. Consider dividing the class based on clan separation also. Almost every place in nature provides a home for some animal. Even the stick in the path is a home for some tiny insect. Be careful not to damage the homes during the investigations. Have each team make a list of the homes they observe. Include on this list:

Kind of Home	Inhabitants	Reason for Choosing This Home

QUESTION: How long does each inhabitant stay at the home you have observed?

(Allow half an hour for this investigation).

Have team reports when all are finished with their charts. They will have a total composite view of homes in the area for animals.



STUDENT INVESTIGATION QUESTIONS

1. Can more than one animal live in the same home?

2. How do they help each other, or do they compete or take turns?

3. Do you know of any interrelationships you can share with the entire class that you may have learned about in the past?

4. Do you know of animals that defend their homes or their territory around their homes?

5. Each animal requires space. What determines the amount of space each animal needs?

6. How do different animals protect themselves? (This is a time when it would be nice to call an elder into the class discussion to share stories and their knowledge of animals and their protective habits).

7. How does a wild (insert name of local animal) protect its family?

8. How do domestic animals like your pets at home protect themselves and their offspring?

    - Choose one of the animals in your natural area and learn how it protects itself.

    - What happens when the enemies compete for the same space?

9. If there are some animals in your area that move from home to home, what determines when they move?*

    - How far do they travel to find new homes?

* Read "Weasel & Eagle" Level VI and "Coyote and the North Wind Level of the Indian Reading Series.

10. Think about the weather and the seasonal changes that take place in your area. In what way do they affect the animals?

    - How do some of the animals in your area protect themselves from the weather?

11. Choose one of the animals from your area and make up a design for protection from adverse weather. Draw a picture and display it in the room.

12. Some animals use their senses to help protect themselves. The deer and antelope have a keen sense of smell. How do they use it to protect themselves?

13. The snake has poor eyesight but can detect heat. How does the snake use that sense to help protect himself?

14. What are some ways that natural surroundings help protect animals?

15. Look at the list of animals that was compiled by your class. Think about the kinds of food available to them in this area. How far do these different animals have to travel to gather food?

    - What are some ways of gathering food?

16. What affects the amount of food available to each of the animals in the area?

    - What is the relationship between the amount of food and the amount of animals present in the area?

    - What happens in a drought year?

17. What effects do tribal activities in this area have on the food source for animals?

    - Look all around the area. List the evidence that people are present. Are there any buildings? Is there any trash? Are there any power lines?

- Investigate one of the main effects on this area. Are there any positive things about the effects?

18. We have looked at animals, their homes, and some of the food they eat, in addition to the effect we have had on all of these. What would happen if all the animals left the reservation?

19. What would happen if all the plants died?

20. Think back to what this place was like a hundred years ago. What kind of animals lived here then?

    - What was the plant life like? Was it drastically different?

    - What caused the change?

21. Think what this place will be like 20, 50, a hundred years from now. What animals and plants will be here then? (Again, this may be a good time to bring in an elder from the tribe to share with the class what the animals were like long ago in the elder's youth).

22. How do the students respond to the talk by the elders?

    - How do they feel about the changes that have taken place?

Refer back to the Web of Life exercise. All animals depend on sun, plants and in some cases, other animals to survive. The natural arrangement is perfect. Man is a part of the web. The influence man has on the web determines to a great degree the quality of life for plants and animals.

GRADE LEVEL: Junior High
Time: 2 or 3 weeks
(This lesson has been adapted from portions of the U. S. Forest Service teacher lesson plans).

"It was good for the skin to touch the earth and the old people liked to remove their moccasins and walk with bare feet on the sacred earth.... For him to sit or lie upon the ground is to be able to think more deeply and to feel more keenly; he can see more clearly into the mysteries of life and come closer in kinship to other lives about him."
Chief Standing Bear
Sioux

FROM THE GROUND UP

According to scientific theory, when the earth's crust began to cool from the molten lava thrust out from the volcanos, there was no soil. As the world cooled, the steam condensed into liquid. Rain sizzled on the scorched surface of the earth and turned to steam again, but at the same time, caused the rocks to crack and crumble. The debris created by this action, called "weathering", was lifeless. Millions of years later, the pioneer plants with no roots began to form on the rocks. The chemical reaction of plants on the rocks produced an acid that broke down the rock and made it available as a source of nutrients. The living plants grew and captured energy from the sun. When the plant died, the dead matter was still rich in energy. Once energy is captured from the sun, it is possible to virtually recycle it. So, the soil is not just rock debris, but also debris from the once-living plants still rich in energy. Today, most of the earth is covered with a foot or more of soil. Some tribes have creation stories or legends such as the Blackfeet Napi stories. Research and present the creation story of your tribe to the class.

EQUIPMENT NEEDED (for a class of 30 people)

6	LaMotte soil pH kits *
6	tape measures
3	sticks (50"/cm or 100"/cm long)
2	shovels
3	yardsticks (metersticks)
100	jelly cups and lids
3	soil thermometers
2	No. 1 cans of water
30	hand lenses
3	baby food jars, half full of water
	Samples of sand, silt, clay (optional)
	Plant samples, drawings, or guides to use with soil pH plant relationship chart (optional)

* Order from:

LaMotte Chemical Products
Chestertown, Maryland 21620

This activity requires an area of land other than a lawn. A vacant lot, or any place that has not been recently cultivated will be adequate. A soil profile is necessary, similar to that found at a stream bank or a road cut. Even a shovel-dug hole a couple of feet deep may show the soil layers.

- Write your own description of "soil". Keep this description for later reference.
- Predict what you will find in the soil area to be studied.

Select an area of about two feet square on the ground and sift through the top three inches, recording the evidence of plants and animals that you observe. Replace the ground in as near original condition as possible.

Name or Description of:

Item in Soil	Quantity	Effect on Soil

"Litter" is defined as identifiable dead things on the surface.

"Duff" is the partially decomposed organic matter that is somewhat compacted.

"Humus" is almost completely decomposed non-identifiable organic matter.

From the chart you just finished, describe the feel and the amount of litter, duff, and humus found in your soil study section.

- How do you think the living things you found affect the soil?
- What might be some reasons for the odors in the soil?
- Under what conditions would you expect to find more or different organisms?

Looking at a soil profile, you can sometimes see that the soil is divided into layers or soil horizons. These horizons develop over many years as water transports minerals from upper regions and carries them downward. This process is called "leaching". Here are four of the most common soil types that can vary depending on the vegetative growth and climate:

1. Prairie soil has no sharp divisions between its upper layers; they blend into one another in this type of soil. This soil is the moist, fertile earth of the corn belt and the tall grass prairie.

2. Chernozem, or the black earth, has a dark layer of humus on the surface; the deeper, light-colored band contains calcium. Wheat and short grasses do well in this type of soil.

3. Gray-brown podzolic soil underlies the temperate broadleaf forest. "Podzol" means 'ash beneath' and refers to the light-colored, washed layer just beneath the thick cover of topsoil.

4. Podzol is the name of the soil that supports northern coniferous forests. Because podzol is acidic, lacks topsoil, and generally requires large amounts of fertilizer, it is not very good for farming.

Litter, duff, and humus are all contained in the "A" Horizon of any soil profile. This layer will have greater temperature changes and moisture content fluctuations than any of the other layers.

The "B" Horizon, or the subsoil, gets minerals that have been washed downward by rainwater. Clay will often be found in this layer.

The "C" Horizon contains loose and weathered rock and is often the parent material of the soil above.

The "R" Horizon is made of bedrock -- solid rock that has not been eroded.

It is very important to emphasize that the depth of any of these layers may vary a great deal. It is not uncommon to never see the "R" Horizon at a road cut or a stream bank.

Looking at the soil profile......

- What do you see at this cross section?
- What are some things you might want to find out about this soil?
- What is the texture of the soil's various layers?
- Take the temperature of all the different layers, if possible, with the soil thermometer. What is the difference in the temperatures?
- With the soil testing kit, determine what the pH factor is of the soil area. Is there a difference in the alkalinity and acidity of the different layers?
- What colors do you see in the different layers?

- What determines the different colors in the layers?
- Using samples from each of the layers and all the data you have just found about your soil profile, make a picture of the soil.

DATA

Air temperatures:

3 feet above the surface ____________________

Just along the surface ____________________

Contents of layers above top soil:

Litter ________________________________

Duff ________________________________

Humus ________________________________

Total depth of layer
above top soil ____________________________

A Horizon:

Depth ____________________

Color ____________________

Texture ____________________(sandy, loamy, clayey)

Structure __________________(columnar, blocky, granular)

pH ________________________

Temperature ________________

- Are plant roots visible?
- Describe the type of rock in the bedrock if it is visible and present.

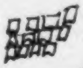
The texture of the soil or how it feels can be done easily by putting a small sample of soil in the palm of your hand and spitting on it. Rub the sample with your thumb.

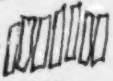
If it feels gritty and not plastic, it is sandy.

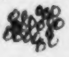
If it feels smooth and slick, or just a little gritty and sticky, it is loamy.

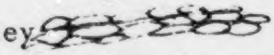
If it feels smooth and plastic and very sticky, it is clayey soil.

Soil is put together in geometric shapes. To determine the structure, carefully break apart a shovelful of soil from each layer and match its characteristics with these words:

Blocky 

Columnar 

Granular 

Platey 

Make a group or individual picture of the soil profile using glue and small samples of soil ingredients from this profile.

It may be important to have local plant identification books, picture keys, etc. for use by participants in interpreting the soil data tables. Include local names and uses where appropriate.

ANALYZING SOIL DATA

Using the soil data collected and the information provided in the soil data tables, complete the following:

- On the basis of color, complete the following: (Refer to Table II)

  The potential of this soil for water storage is ______________________________

  Why? ______________________________

- On the basis of color, complete the following: (Refer to Table II)

  Amount of organic material ________________

  Erosion factor ____________________

  Fertility ______________________

  The drainage in the subsurface soi, or "B" Horizon is ______________________________

SOIL DATA TABLES

TABLE I. RELATIONSHIPS OF SOIL DEPTH TO PLANT GROWTH AND WATER STORAGE

Soil Depth	Water Storage
Deep Soil (over 42" or 1.1m.)	Excellent water storage and plant growth
Mod. Deep Soil (20"-42" or 0.6-1.1m.)	Good water storage and plant growth
Shallow Soil (20" or 0.6m. and under)	Poor water storage and plant growth

TABLE II. SOME RELATIONSHIPS OF COLOR TO SOIL CONDITIONS

TOPSOIL (A HORIZON)

Condition	Color		
	Dark (dark grey brown to black)	Moderately dark (brown to yellow-brown)	Light (pale brown to yellow)
Amount of organic material	High	Medium	Low
Erosion factor	Low	Medium	High
Aeration	High	Medium	Low
Available Nitrogen	High	Medium	Low
Fertility	High	Medium	Low

SUBSURFACE SOIL (B HORIZON)

Subsurface soil color	Condition
Dull grey (if in low rainfall soils 0-20")	Water-logged soils, poor aeration
Yellow, red-brown, black (if in forest soils)	Well-drained soils
Mottled grey (if in humid soils)	Somewhat poorly to poorly drained soils

TABLE III, SOME EFFECTS OF TEXTURE ON SOIL CONDITIONS

Texture	Water holding capacity	Looseness of soil
Sandy	Poor	Good
Loamy	Good to excellent	Good
Clayey	High(water held too tightly for plant use)	Poor

TABLE V. RELATIONSHIPS OF SOIL PH TO PLANT SPECIES

3.5	4.5	6.5	7	8.5	14
(3.5 to 4.5 is too acid for many plants)		(Most plants do best here)		(8.5 to 14 is to alkaline for most plants)	

Some examples of soil PH plant indicators:

pH 4.0-5.0:	Rhododendrons, camellias, azaleas, blueberries, some ferns, hemlocks, some pines and spruces
pH 5.0-6.0:	Some pines, firs, holly, daphne, some spruce, oaks, birch willow, rhododendron.
pH 6.0-7.0:	Maple, mountain ash, pansy, asters, peaches, carrots, lettuce, pines, firs ash, basswood elm, yellow poplar.
pH7.0-8.0:	Mock orange, asparagus, sagebrush, red cedar.

Note: These relationships may vary slightly in different environments.

TABLE VI. SOME RELATIONSHIPS OF SOIL TEMPERATURE TO PLANT GROWTH

Soil temperature	Plant growth during growing season
Less than 40°F (4.4°C)	No growth, soil bacteria and fungi not very active
40°F-65°F (4.4°C-18.3°C)	Some growth
65°F-70°F (18.3°C-21.1°C)	Fastest growth
70°F-85°F (21.1°C-29.4°C)	Some growth
Above 85°F (29.4°C)	No growth

QUESTIONS AND DISCUSSION

The Soil

1. Using the observed color of the top layer, and Table II, A and B, what did you say about the erosion factor of your soil?

2. Using the structure of your soil and Table IV, what did you say about the drainage of water?

3. How well did the plants in the study area conform to the soil pH plant chart?

4. Have groups read how they would set up their own soil pH/plant chart? Point out that soil scientists determine soil pH and record the plants growing in the area to construct a table or chart for use in interpreting soil pH/plant relationships elsewhere.

5. If there is a Soil Conservation Service soil survey report describing local soils available, read its description of the soil just studied. Point out that these reports are prepared from the same information we used. Compare the Soil Conservation Service description with the participant's description. Usually, the descriptions are very similar.

6. How does this soil description differ from the one you wrote in the beginning of this activity?

7. How do you feel about the present use of this land?

8. How could people improve the use of this land?

9. What are some uses which could damage the land? What environmental precautions should be taken to minimize the damage?

10. How do the things we have done so far relate to making land-use decisions?

11. What are some long-range effects of land-use decisions on the tribe?

Soil Search

1. What are some traditional native words used to describe soil?

   Research a local legend or story about soil or the earth.

2. Did the soil have a special value in traditional culture?

3. Do the traditional values concerning soil and the earth play a part in the land management of the reservation today?

4. How would the students change present management policies?

5. Are there written tribal policies regarding land use on the reservation?

6. How have these policies changed from the "unwritten" policies of a hundred years ago?

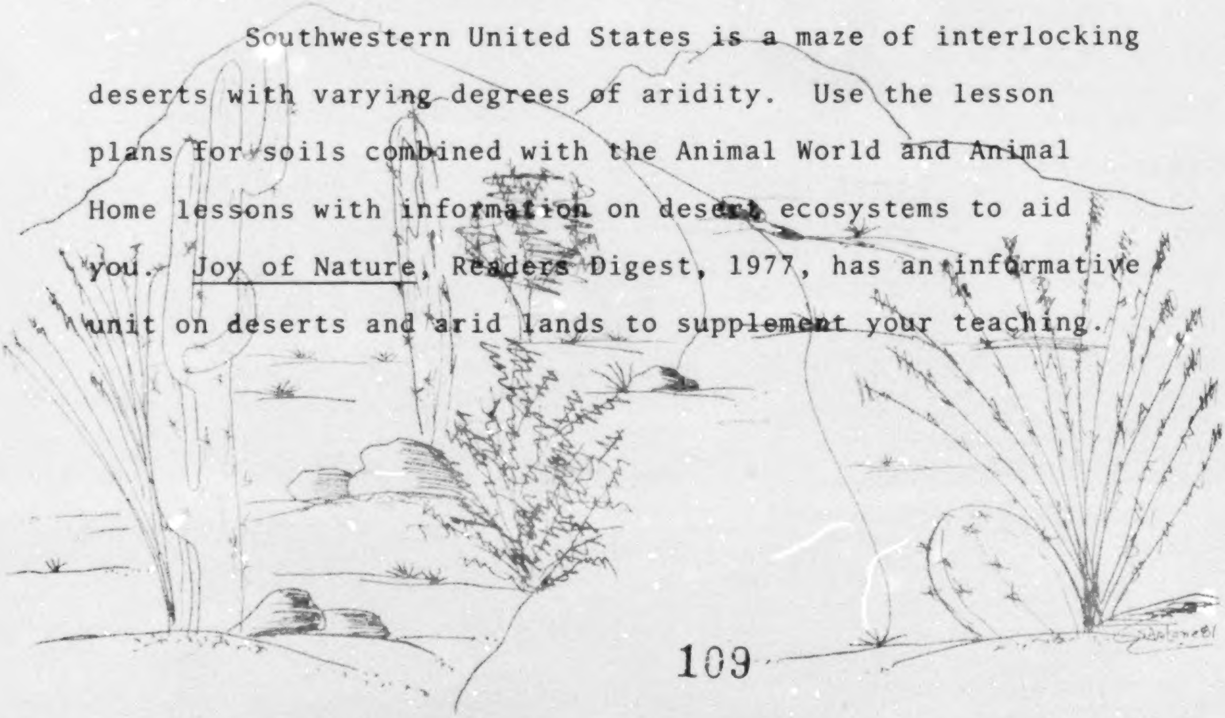
7. How was the reservation land different a hundred years ago from what it is today?

Look to the Future

1. How will the land change 20, 50, even a hundred years from now?
2. In what way has the research you have done in this lesson helped you make some predictions?
3. How are the specific characteristics of soil important to the land-use plans and management policies on the reservation?
4. How can we summarize this discussion and investigation?

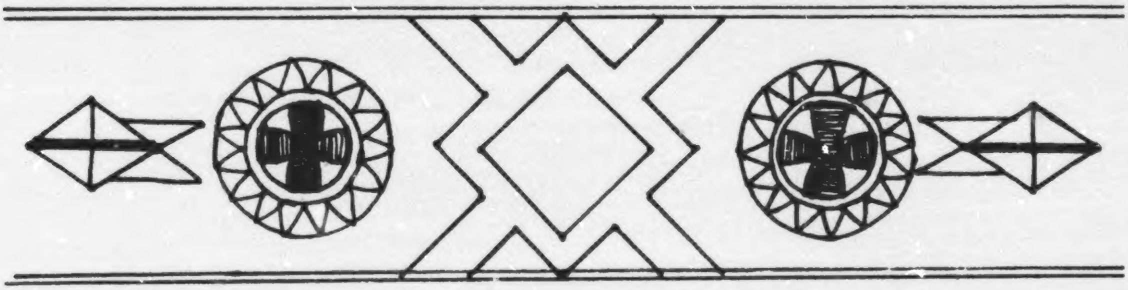
There are many reservations located on deserts in the southwestern United States. The people, plants, and animals that live there epitomize the word adaptation. They are truly at home on arid land. The reason deserts are not deserted is that many forms of life have adapted to extremes in living conditions. The word desert brings to mind sand, yet the Sahara, containing more sand than any other desert, is only sandy over 10% of its total surface.

Southwestern United States is a maze of interlocking deserts with varying degrees of aridity. Use the lesson plans for soils combined with the Animal World and Animal Home lessons with information on desert ecosystems to aid you. Joy of Nature, Readers Digest, 1977, has an informative unit on deserts and arid lands to supplement your teaching.



So far, you have helped your students:

- investigate the specific qualities of soil.
- research past and present land management.
- determine the effect soil plays in proper land management.
- express feelings about land use on the reservation.



GRADE LEVEL: Junior High
Time: Two weeks

ECOSYSTEM

The students have been investigating living and non-living things in one particular area. That area of self-renewing relationships is called an ecosystem.

The students have also been learning about food that animals eat. Can your students construct a food chain from their investigations?

A food chain is a chain of organisms in which each link feeds on the other one ahead and is eaten by the one behind. For example, man eats pike eats bluegill eats insects eats protozoa, which eat algae.

- Construct a food chain of your area.

Look again at the list of animals found in your area. You have already determined what the animal eats. The animal may eat more than one thing. Is your animal a herbivore, eating only plant material? Is your animal a carnivore, eating only meat material? Or is your animal an omnivore, eating some of each from time to time?

An ecosystem is composed of living and non-living things, as we have already learned. Each living thing has its organized place in the community. There are producers, consumers, and decomposers, all living in their own niche.

The producer is a green plant able to make its own food by photosynthesis. A consumer is an organism that depends on producers for its food needs. A decomposer is an organism that obtains its food from waste and dead organisms. A niche is more than a place. Each species has its place in the natural pattern. The niche is determined by the food the organism eats AND the kind of job the organisms do for the ecosystem. So a niche can be thought of as a combination of who you are and what you do in the natural world. From this information, construct the food chain of producers, consumers, and decomposers in your reservation. Remember, only one species can occupy the same ecological niche at one time. Although the position of the niche may change with the season, only one species at a time can occupy that spot. Can you think of animals in your area that change niche positions with the seasons?

Back in the classroom, apply what we have learned about animals to humans.

DISCUSSION AND QUESTIONS

1. Where do we live?

   - Do people have different kinds of structures to live in?

   - Just consider the United States and think of all the different homes people construct. What generally determines the kind of homes people live in? *

   - How does that compare with the animal world and how do they construct their homes?

2. Thinking back again a hundred years ago, what kind of homes were used then?

   - Why has change taken place?

   - How do you feel about the changes?

3. Animals depend on certain things in life for survival. What things in nature do we depend on?

   - What makes the difference?

4. All over the world people must have food to survive. Think about how animals gather their food and where they live in relation to the food they require.

   - What kinds of situations do people become involved in to gather food?**

* Read "Our Homes Then and Now" and "Teepee Making" Level IV of the Indian Reading Series.

** Read "Stories of an Indian Boy" Level V and "Adventures on an Island" Level VI of the Indian Reading Series.

5. Think back a hundred years and imagine how food was gathered by your ancestors. What has changed since then?

    - How do you feel about the change?

6. Animals need to defend their territory from time to time. Do people defend their homes? *

    - Why is this necessary?

7. Think back a hundred years ago. How has defense of property changed from when your ancestors defended their homes?

    - Do we defend different things now than then?

In some environments, there are conditions the animals have adapted to. The animals have developed certain physical features and abilities, which help them survive. They may also have developed certain behaviors and habits.

8. Are there conditions in environment that man has had to adapt to? Name as many as you can.

Think back to your great grandparents and the kinds of things they would have to adapt to if they were alive today. Think of the things they have had to adapt to in their lifetimes.

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* Read "A Young Warrior" Level V;"Long Hair", "Scabby Bear", Level VI of the Indian Reading Series.

9. In what ways are people able to adapt to their environment?

Sometimes there are unhealthy conditions that exist in an environment. Those unhealthy conditions are things that both man and animal have trouble adapting to.

10. If some unhealthy conditions exist on your reservation, do you need more information about them?

    - What places and what people would you go to for help?

11. If there is a serious problem in or near your community which needs immediate attention, describe it as well as you can and tell why it is important to you. (Perhaps this can be a class investigation.)

    - What do you think should be done about this problem?
    - How can you get other people in your community interested?
    - What can you or your classmates, or your family do to help try to solve this problem?

12. How were environmental problems of the tribe solved a hundred years ago?

13. What has brought about change in problem-solving practices?

GRADE LEVEL: Junior High

Time: 2 or 3 weeks
45 minutes each day

(This lesson has been adapted from portions of the National Park Service, Strands Walk).

STRANDS WALK

NOTES TO THE TEACHER

The following lesson plan is designed for you to lead students through an exercise to examine the place where they live. They will explore how it was in the past, what it will be like in the future, and the effect of the students' use in their surroundings. It will be necessary for the students to work in groups. The lesson may be done in the classroom as a follow-up on an outdoor activity, or it may be conducted just outside the classroom.

Emphasis throughout this lesson is on the five strands that environmental education is centered around. They include:

Variety and Similarity - many likenesses and differences exist in people and their surroundings. A variety of functions and structures exist in processes, both natural and man-made, yet sufficient similarities permit classification into orderly patterns.

Patterns - patterns are found in organization like social groups of people or animals as well as rock formations. Mechanical patterns are found in such things as classroom schedules and traffic flow. Space patterns exist in both nature and by man's design.

Interaction and interdependence - nothing exists in isolation. The reservation and tribe are a part of the state, the world, therefore, naturally interacting with the entities around it. Laws and technology may influence the action and the degree of dependence. As in nature, the process of interdependence goes on continuously, nourishing and fostering life and the quality of life.

Continuity and change - both living and non-living things are in a constant state of change. People change with influence, but some things remain intact in the traditional values of the people. The degree of change is determined only by how much each person is willing to allow.

Evolution and adaptation - systems, cultures, living, and non-living things over centuries and centuries alter and develop in the process of evolution. The features which exist today of an ancient culture have evolved from generation to generation.

These activities are designed to build trust and confidence in the student in their own ideas and perceptions. They provide you, the teacher, an opportunity to discuss their personal ideas about the reservation and culture in a non-judgmental manner. The relationship thus established is important in this lesson. The lesson will reveal to you what is important to the students and what they think about. It may help you understand the group; and by virtue of the group working together, understand how each student performs in a group process.

This lesson plan is appropriate for any tribe, on any reservation, living in any kind of ecosystem. It will be necessary for the students to understand grouping and classification. It is important that the students be allowed to draw their own conclusions about the directions. They are entitled to their own values and conclusions.

This activity will allow the student to express feelings about the reservation and their way of life in a totally non-threatening way. Each student is given the opportunity and encouragement to participate. Each student is allowed their interpretation, and if the interpretation is to be challenged, let it happen in the group itself. As the teacher, your role is one of guidance.

The lesson plan is very open and non-specific in the directions. Be sure to review it once or twice with a fellow teacher or a parent before trying the activities with the students.

VARIETY AND SIMILARITY

A. Ask the students to individually select five (5) things around them from the reservation and list below:

1.
2.
3.
4.
5.

B. Make a group list with the combined team lists from above. Have five students on each team. Let them decide what things to include on the combined list. How will they decide what stays on the list and what goes? The oldest things? All outdoor things? The most important things? The things they alone use? Things only connected with the school? Let them decide.

1.
2.
3.
4.
5.

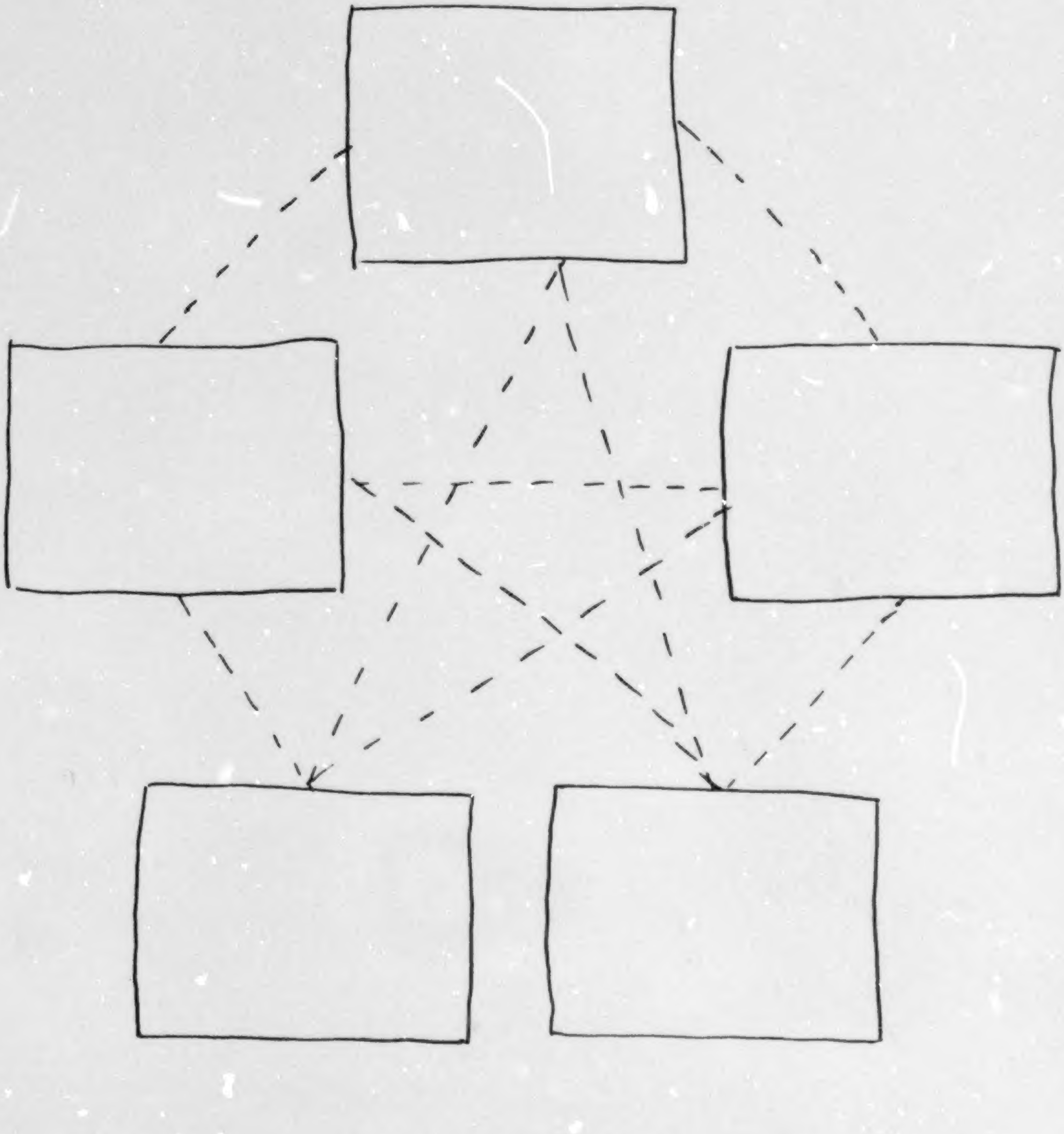
C. Ask them to be prepared to describe the basis on which they decided the relationship among items on their list.

INTERACTION AND INTERDEPENDENCE

A. Write your five observations in the boxes below.

B. Now see how many you can connect that act on, need, or are related to each other. Tell how.

C. Are any the results of other interrelationships?



CONTINUITY AND CHANGE

A. How many of your observations today are examples of change or are clues to the past?

1.

2.

3.

4.

5.

- Why are they here today?
- Are they used differently today than they were in the past?

B. Think of five (5) things that aren't here today on the reservations but were some time ago.

1.

2.

3.

4.

5.

- Why aren't they here today?

  (Interview some of the elders in your tribe and discuss with them why these things have passed and how they were used.)

- How do you feel about them not being here anymore?

EVOLUTION AND ADAPTATION

A. How many of your observations today show "adaptation"?

- Why are they here today?

  1.

  2.

  3.

  4.

  5.

- Which of these things will be here tomorrow?
- Why?

B. Think of five (5) things that aren't here today but might be here tomorrow or some time in the future.

1.

2.

3.

4.

5.

- When will they be here?
- Why do you think they will be here?

  (Again, interview some of the elders in your tribe and get their responses to these questions.)

- Are their answers different from yours?
- Why do you think your answers are different or why are they similar?

C. Do you want the things to return that were listed above?

- Do the elders want them to return?

PROBLEM FOCUS

A. Individually now, write out one or two questions that you have about the reservations.

1.

2.

B. Compare these questions with others of your group for similarities and/or differences.

- Combine any of the questions in your team?

1.

2.

3.

4.

5.

C. What kinds of questions do you have?

- Are the questions about the schooling available to you? Questions about jobs? Are the questions about any of the natural resources on your reservation? Are they about politics, or traditional beliefs, or religion? Are they about social structure in your tribe?
- Are the questions data questions about numbers or quantities? Or are the questions asking for clarification or deeper understanding.

D. Select one question from your compiled group questions and, as a group, do some follow-up.

E. Write out as many possible explanations or answers you might have for it now.

1.

2.

3.

4.

5.

F. Take each one at a time, and design a means of answering or testing it.

Equipment needed:

The problem focus part of this lesson will help the student follow through with this past data cycle --- gathering information, opinions, observations, and results of experiments...and finally, learning how to state a question and seek an answer from experience.

Overall, the student will feel a oneness with the surroundings. The student has looked at the reservation and the traditional culture. Their behavior is a product of the surroundings and some influences outside the reservation. They are an extension of all their experience with these influences.

GRADE LEVEL: Five - Six
Time: Two-three Weeks

it is never easy to be different
from most

this is why so many
Indian people choose to live
away

from the city

THE CITY DOES NOT HAVE AN
INDIAN HEART

Charlie Clark
Medallions Collection

FOR URBAN STUDIES

Some of the very same techniques and processes used outdoors in a natural environment can be incorporated into an urban study as well. For the teacher of the urban Indian child, the following lessons are suggested.

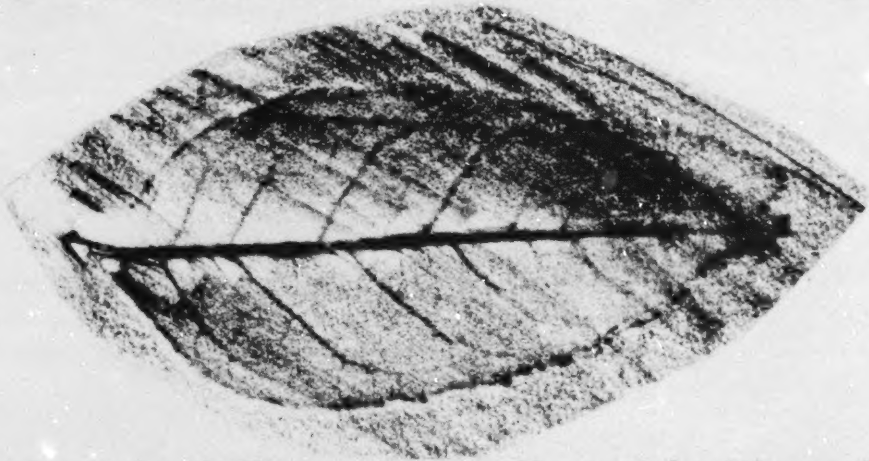
Before going outside into the city, have the students sharpen their senses with classroom exercises of sensory awareness. As with the Sensory Walk lesson, have the students close their eyes and isolate one sense at a time. Pause after using each sense to allow time for the students to reflect on their private feelings. It has been our experience that students crave this type of activity. They giggle a lot, but always ask to do it one more time.

Outside......

Divide the class into teams of sight, smell, sound and touch. Tasting must be regulated closely; use your own discretion. Ask each team to select a team spokesperson for reporting the team's findings. The teams may choose to use worksheets to report their findings. What are some other ways to communicate what each team found in their senses trek?

A sample worksheet follows......

Have the class combine their senses reports into a report for the principal of the building. Use a mural of rubbings for the things the touch team discovered, a tape recording of sounds for the sound team, and pictures for the sight team. How could you describe the smelling things?



* Use charcoal, chalk, crayon, pencil, or ink with a roller to obtain fextures and prints. Place the paper over the item to be rubbed and use the charcoal to lift the texture.

SENSES WORKSHEET

City Senses

I am on the ________________________________team.

My team reporter is _____________________________.

We are taking along the following equipment:

Below, name and describe each of the discoveries:

Natural	Human made

A * is next to our most interesting discovery.

Name______________________________________

Date_____________________

Location__________________________________

Weather Observations_______________________

Divide the class another time into teams for shapes, textures, patterns, and colors. Have the teams watch for specific patterns in street arrangement. Have the shapes team scout for various shapes in one single block. What are the variety of textures just in this classroom? What are the textures in this school lot? What determines the different textures?

How many different colors in the structural materials? Do crayon rubbings of the textures. How many different colors are there in the school?

A treasure hunt can be an exciting way to learn about the neighborhood. Each student could have a different thing to find or give the entire list to the entire class and let them have a week to complete it. Encourage the students to contribute.

Items to Find

- a relic of the past
- something that represents your heritage
- something like you
- a hiding place
- something funny
- something scary
- something that cannot be photographed
- a sign of caring

- a sign of carelessness
- a warning
- a message
- an omen
- a sign of patriotism
- something you cannot count
- something you do not understand

Surveys are also ways of learning about the place where you live. They can tell a lot about the people around you. Choose a parking lot near school or the school parking lot.

- Make a list of the bumper stickers.
- Make a list of the colors of cars and how many of each.
- How many cars from different counties? States?
- How many government cars?
- Make a list of the kinds of cars.
- Are they foreign or American-made vehicles?
- How many sports cars?
- How many four-wheel drive vehicles?
- How many trucks?
- What can you tell about the people from the cars they drive?
- What cautions would you give concerning assumptions about people from the car they drive?

There are also things to count in your neighborhood:

- trash cans
- public telephones
- public restrooms
- bus stops
- animals
- flowers
- swings
- trees
- churches
- signs for traffic
- signs for advertising
- other things to count

Assign someone in your group to count the number of people per car in the same two minutes.

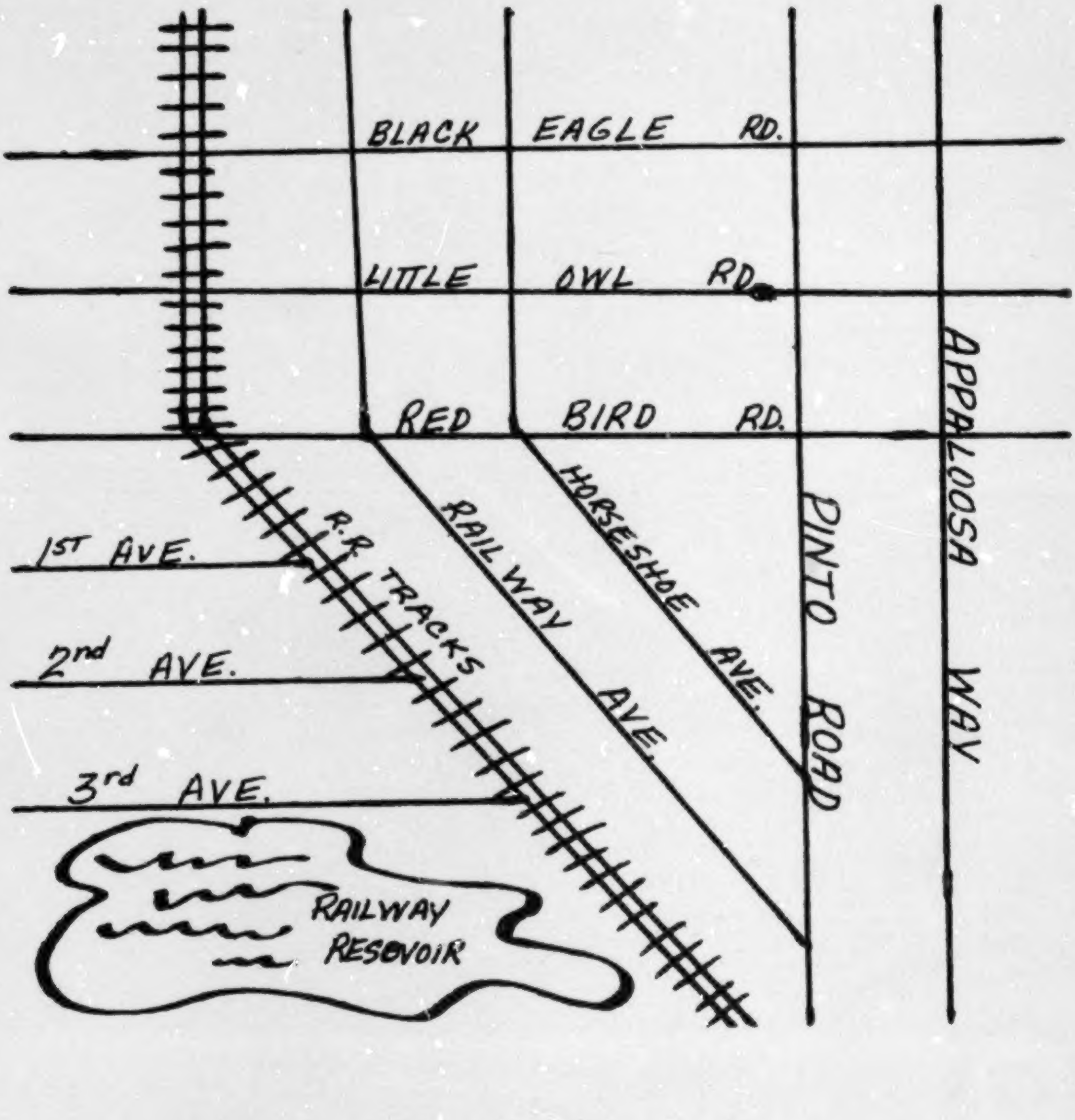
- What is the average number of people per car?
- Is public transportation available in your neighborhood?
- What are some of the reasons for not using public transportation?
- What can you say about the traffic in your neighborhood?

Divide the class into three teams to look at the neighborhood in a different way. Have a team for eye level, overhead, and underfoot. Have them make observations and records of what they find at each of their assigned areas in a city block. In doing a mural for the classroom, have the underfoot team draw their findings, the eye level team draw what they found, and the overhead team finish up the project.

How are some tribe clans based? Ask the students to explore clan divisions. Some are based on winged, four legged, swimming, or crawling animals. Try this activity from a clan basis and experience an area as one of these groups of animals.

Look at the total picture. List the living and the non-living separately. What surprises you the most about living things?

Understanding the total picture of a natural land area is an important tool for wise land use. So, too, is understanding the total picture of land use in the city or town. For this next lesson, it will be helpful to obtain a large map of your town.


BLACK EAGLE RD.
LITTLE OWL RD.
RED BIRD RD.
APPALOOSA WAY
PINTO ROAD
HORSESHOE AVE.
RAILWAY AVE.
R.R. TRACKS
1ST AVE.
2nd AVE.
3rd AVE.
RAILWAY RESEVOIR

WHAT CAN YOU LEARN FROM A CITY STREET CORNER?

Divide the class into three teams again. You will need a jobs team, a people team, and a transportation team. List all the jobs you see being done.

- How many different kinds of transportation are available here?

Watch people on this corner for a time period. How do people dress here?

Choose one person to watch closely...be respectful of the person.

- How does that person dress?
- How does that person walk?
- What kind of facial expression does that person have today?
- Where do you think that person lives?

Later in your classroom, imagine that you are that person:

- How do you feel? Write a story of the day in the life of that person.

LITTLE PLACE

Sometimes in a large city, it is easy to pass by the little things. This next lesson plan is designed to look at the small things.

- Stake your claim...a small area, just big entough to stretch out.
- Sit alone quietly by your claim.
- What is the air like?
- Bend close to your claim and sniff the air with your eyes closed. The air smells like __________ ____.
- Dig your fingers into the soil. The dirt is ___ ____.
- Is the vegetation in your claim dense or sparse?
- Look more closely at your claim. Find an animal/insect between the roots, stems, leaves, or rocks of your claim. With pencil, draw the animal/insect on the back of this worksheet.
- What is it doing?
- How does it protect itself?
- Where is its home?
- How many plants live in your claim?
- Look around at other claims your classmates have chosen. How are they different?

BIG PLACE

Let's look at the city where you live. No matter what the size of your town, it had a beginning with a reason. What is the reason for your town being where it is?

(You may need to research in the city library for this information, or look into the local historical society).

- Map your town, locating generally the residential areas, major stores or shopping districts, main highways and freeways, railroads and airports, large industrial areas, schools, and parks.
- Why is your town shaped the way it is? Is it a certain shape because of a river? Railroad?
- What role did people play in the shaping of your town?
- Has your town always been this shape?
- How did it look 25 years ago? 50 years ago?
- How long has your family lived in this town? In this same neighborhood?
- Where did your family move from if it has been within your lifetime?

What are some of the advantages and disadvantages of the town's location in relation to its growth? Think about how the town's location would affect it if the population were increasing or decreasing or if the town wanted to make improvements in its facilities and buildings.

Advantages	Disadvantages

- What is the climate like in your town?
- What is the average temperature of all seasons?

Winter__________ Summer_____________

Spring _________ Fall _____________

- How does the temperature affect the kind of industry in your town?

Land is a basic resource for all living things.

- How has land in and around your town been used in the past?
- How is it being used now?
- What are your predictions for the future?
- How does it affect the kinds of homes that are built?
- How does it affect the way people live?
- What are the natural features near your town that most affect the climate?
- Are you near mountains, a lake, a mesa, or the desert?
- To what extent does the climate affect the reason for your town existing where it does today?

	Land User	Use of The Land	Type of Settlement	Affects Environment	What value in Environment
PAST					
PRESENT					
FUTURE					

- What are some ways you would like to see the land used in the future?
- What agencies or offices make the land-use decisions?
- Does your town have zoning laws? Obtain a copy of some of them.
- What are the major problems of land use in your town?
- Now that you know some zoning laws, what are some ways you can think of to solve the problems?

Let's look closer at the people in your town/village/city.

- How many people live in your city?
- Do a lot of people drive to your town to work during the day and drive back home someplace else in the evening?
- Do a lot of people in your town drive to another place to work and return to your town in the evening?
- Is the population spread out or located mainly in a particular area?
- How large an area does your city occupy? The city map should be the right place to get the answer.

How large an area does your classroom occupy? Determine the length and width of your classroom.

_______ x _______ = ____________________
Length Width Square feet

This gives the area of your classroom in square feet.

Divide the number of people in your classroom by the square feet available. This equals the population density of your classroom or the number of people in a given area.

__________	x	__________	=	____________________
Number of people		Number of Sq. Ft.		Population density per square foot

Knowing the number of people in your town and its approximate size, can you determine its population density? You can use square feet or square miles.

- Which is best?
- Which areas in your city are the most crowded?
- How do you feel when you are in a crowd?
- Why do people live in crowded areas?
- Does crowding in a city have anything to do with other city problems such as unemployment or racial discrimination?

Do some experiments in your class. For a day, push all your sitting places together in a close circle. Use only half the classroom.

- What are some changes in your classmates that you observe?
- What changes in yourself have you felt?
- What can you say about people and their required space?

Go to an open space near your school. Observe the activities of animals such as sparrows and squirrels. What is their behavior in relation to their territory?

- How does that compare with the way humans behave?

Think back at least a hundred years. What happened in the United States with land and people? The United States government started designating certain lands as reservations for the Indian tribes. Many changes took place in the lives of Indians and has affected the way they live today.

* Read "Little Ghost Bull" Level V and "Willie's Tribe" Level VI from the Northwest Education Laboratory Indian Reading Series to accompany this lesson.

- Is your life affected because the government formed these reservations?
- What are some of the advantages to the tribes having reservations?
- What are some disadvantages?
- How many people live on the Indian reservation near you who are not Indians?

Comments: ______________________________

Try to find out what it was like for an Indian family living with a tribe during the summer months when an encampment was formed and large groups of people lived together.*

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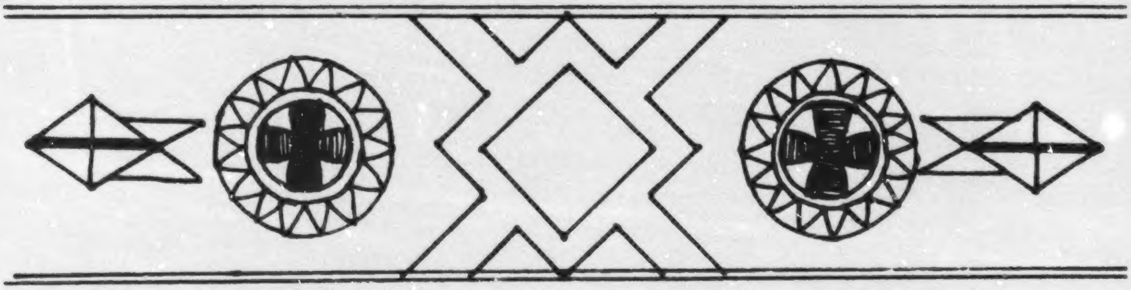
* Read "Visit to Taholah" Level V from the Northwest Education Laboratory Indian Reading Series to accompany this lesson.

- What might have been some of the problems similar to those we find in cities today?
- What was the organization of the large gatherings in those days?
- Was someone assigned to bring food every day?
- Was someone assigned to teach the children?
- Where were the clothes washed?
- How did people get the things they needed to make clothing and gifts for their friends?
- Were there hospitals and clinics?

Make as detailed a comparison as possible. Think about today's conveniences and yesterday's attitudes about the land resources. Why didn't the entire tribe stay in one place all their lives?

So far you have helped your students

- explore the relationship between space and behavior.
- look at the reservation as a land space and explore their feelings about their land.



LEADING CHILDREN IN THE FIELD

-- a few hints --

BEFORE THE TRIP

Prepare Yourself

- Define an objective. What are you trying to accomplish?
- Know the area. Walk the trail. Decide where you want to go. Anticipate things that will contribute to the objective. Look for hazards.
- Know your activities. What are you going to have the group do? What will you need to take?
- Review discovery concept. Remember you are helping the students discover things for themselves. You don't need to know all the answers yourself.

Prepare the Group

- Create an objective. The group will often become more excited and motivated if they help define the objective.
- Build up anticipation. Photographs, readings, specimens from the field, trip planning sessions... all may help get the class involved.

DURING THE TRIP

Group Maintenance

- Explain what, where and when.
  - What are you going to do?
  - Where are you going to go?
  - How long will you be gone?

- Define the rules. Should the group walk behind you? Or can they go ahead a ways? If so, how far? Where should they go to the bathroom? Are there hazards to stay away from?

- Without restricting freedom, channel the group's activities toward the planned activities. If a deer runs through the group, smoothly take advantage of the excitement, but then get back to the planned activities. Don't tell them what not to do! Tell them what they can do.

Safety

- Walk -- Don't Run. (Unless running is part of the activity.)

- Warn the group of hazards in a constructive way. Tell them about rattlesnakes, but emphasize the ways to react if they see one.

- Watch where their feet go. Tell them to be alert to everything around them.

- Be prepared for emergencies. Take a first-aid kit. Monitor the group and steer them away from potential hazards.

Conservation

- The group is visiting the home of living creatures... explain that they need not be destructive. Point out constructively the impact they have on the environment by just walking on the grass.

- Practice conservation. Make a point to incorporate some conservative activities and objectives. Collect litter, reclaim a disturbed area, leave the study area better than they found it.

Techniques

- Explain objectives and activities.

- Encourage discovery and questioning.

- Use all senses.
- Move rapidly to activities. Give the group something to do, but let discussion proceed as long as it's worthwhile.
- Take advantage of surprises. Stop to look at interesting and unusual things.
- Use games, songs, creative dramatics and other techniques to build interest.
- Don't allow one student to dominate the discussions.
- Keep the field trip to a reasonable length and allow for rest stops. Even kids get fatigued.
- Don't belabor an activity if the group becomes bored....move onto the next activity. Remember that young people may be interested in different things than you are. Observe their reactions.
- Conclude the activities on a high note, a climax.

AFTER THE TRIP -- LET THE MEMORY LINGER ON

- Summarize things and events. Don't let the field trip end when you get back to the classroom. Encourage discussions about what they saw and did.
- Follow-up activities. Relate the trip to other subjects and build toward other trips. Use the first trip as a beginning for in-classroom activities that can be related to additional field studies. Remember, the field trip should be part of the normal curriculum...a routine activity and not a special event.

Outdoor Classroom Objectives

- To use an outdoor setting to promote interaction and communication among the participants.
- To develop personal knowledge of an outdoor environment through awareness activities, investigation, and individual reflection.
- To develop an awareness of the cycles that exist in every type of environment and the effect they have on our personal lives.

All Outdoor Classroom Lessons Should

- Actually involve the learner in the environment.
- Be relevant to the student according to the age level and preliminary classroom instruction.
- Include an opportunity for problem-solving, and for the learner to collect and record data based on observations.
- Serve as a vehicle to introduce other curriculum topics.

CONDUCTING OUTDOOR LESSONS

Pre-planning

- Small groups (10 to 16) are advisable. Get extra help if needed (teach your volunteers, build their confidence by having them follow you several times). Be aware of your transportation needs.
- Proper clothing and gear should be announced before the trip.
- Determine how much time will be involved.
- All activities are more effective when integrated with other learning experiences. These other experiences could include a trip orientation, bus trip activities, actual field trip experiences, and follow-up activities.

The Trip Itself

- During the bus trip, look for interesting and major land features of an area. Leave preparatory remarks to near the end of the ride to the area.

- Field experience should be "discovery" rather than "show me".

  - Use the five senses in exploring (e.g. sensory walk).

  - Don't overstress "naming".

  - Evaluate the learning experience after each site.

  - Utilize questioning strategy detailed in "investigations--developing your own".

DEVELOP THE ENVIRONMENTAL TEACHING PATTERN

Encounter - a direct personal experience by the student with some aspect of the natural or constructed world. This creates an interest for further learning.

Interpretation - building upon the student's initial interest, the facilitator should then help him/her identify significant features of what has been found. This should increase understanding of his/her discovery.

Relate to Science - next the leader should show how the discovery relates to some scientific concept. This holds for the city as well as the natural environment.

Relate to People - try to relate the concept and/or the specific discovery to people and an environmental problem.

REVIEW

- Suggest follow-up activities to be done elsewhere.
- Ask suggestions for more follow-up activities.
- Have group members write down their evaluations for the field trip.
- What do the participants remember most? Why?

DEVELOP YOUR INVESTIGATION

Open - Allows everyone to participate - obtain a lot of general data. (Example: What kinds of animals might be found in this area?)

Focus - Focus attention on specific data as a central point for discussion. (Example: What evidence would indicate the presence of deer in the area?)

Interpretative - Seeks relationships. Compare, contrast, relate specific points in the data. (Example: What reasons are there for the thriving deer population in this area compared to the area across the road?)

Capstone - Calls for a statement which summarizes what has been discussed. (Example: Based on observations, what can be said about deer habitat?)

The four types of questions above are used to lead students to involvement in their outdoor learning laboratory.

The outdoor activities can help students understand social studies lessons with direct application. Science is more meaningful as the student is involved in the biology, geology, and chemistry around him. Use the high interest in outdoor activities to apply math concepts in those lessons.

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